SELECTED READINGS FROM RECENT TRENDS IN EDUCATIONAL IDEAS AND PRACTICES

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&

ACADEMIC STAFF COLLEGE

UNIVERSITY OF CALCUTTA

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A collection of talks
presented in The Eleventh Refresher Course in Education
[8th June to 28th June, 2005]

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EDITORIAL NOTE

Education in the contemporary times of the Twentifirst Century is passing through a crucial phase characterized by overt conflict between traditional beliefs, values and approaches on the one hand and the superfast pace of changing needs, aspirations and technology on the other. Caught between the two opposing philosophies of educational ideas and practices are the students and their teachers at various levels of education, some living in glittering megapolis and others in the remote villages still plunged into darkness in every sense of the term. Therefore, when any programme is arranged in order to keep our teachers abreast with recent trends of educational ideas and practice one finds it extremely difficult to bring together the most appropriate speakers and to choose the most adequate set of topics that can do full justice to a comprehensive account of the changing face of modern education.

When the Eleventh Refresher Course in Education was organized with the above mentioned thrust area the coordinators most probably, faced the same problem. But they did not hesitate to invite speakers from different disciplines and requested them to speak on the topics of their own choice with the expectation that the speaker will not only contribute to the elevation of the knowledge base of college teachers but also it will be a collective effort to the decisions related to what are the priority areas and which topics are to be given most importance in the context of current trends. Perhaps their hopes were not betrayed. Collection of the lecture notes is now being published with a view to provide the reader with a chance to have glimpses of modern trends of educational ideas and practices. But all the lecture notes were not available to them in the from of ready articles which made this publication selective and a little bit delayed.

Subjects of speakers' choice covers both the idea and practice of education in modern times. Some of the lectures focussed on the current needs, actions and their conceptual framework. The concept note on life style education, Reading and writing motivation of children in primary education, and Instructional objectives : uses in teaching, evaluation and text book writing belong to that type. Other speakers preferred to deliberate upon the theoretical and some philosophical visions and future course of education. Topics like Futuristic education, Going to dual mode : a small leap but a big challenge, Quality assurance through total quality management, Professional ethics for the teaching community, Present system of higher education : pros and cons in terms of quality of education and quality of life are some such topics that are apparently diverse in content but are integrated actually inherently by their intention.

Environmental education, a dire necessity of modern times, has not been ignored as well. It was taken up in the topics like Environmental and emergence of environmental science.

Other topics were selected with the straight forward aim of providing up to date knowledge about some topic, usually included in the syllabus at various levels of educational studies.

These topics are concerned both with the theory and practice of education. Topics like Models of memory, Educational management, Education of the persons with disability, Teaching system, Models of teaching, Scaling test scores, Research designs in education, Recent trends in curriculum development. New era in hearing impaired children, and Tathya Prakriya Karan Shikshan Tattwo (Bengali) all envisaged to enhance our knowledge in the respective fields.

Periodicity of recency or currentness is fast shrinking now a days. It is really impossible to refresh knowledge through a single discourse or a set of lectures occasionally. The aim is primarily to make our reader aware of the diversity, fast changing nature and complexity of the multifaceted modern education. If they are really aware and if they really feel hungry for knowledge in the long run, the editors will feel amply rewarded for their labour.

Editor
&
Associate Editors

Kolkata
May, 2006.

THE CONCEPT NOTE ON LIFE STYLE EDUCATION

Ranju Gopal Mukherjee *

The Back-Ground

A human child grows up naturally like any other living creature. The development and growth of its physical and mental aspects largely depend upon the child's environments. Its nourishment, the socio-educational standard of its family, the nature of its social sphere etc. act as regulatory factors. Every child develops through this system. Then coming of age at a special time gathers a new dimension. The boys and girls grow up in a special way. Their life experiences successive turns. This process of change from early youth to maturity takes place over a few years. This phase in life is called adolescence. Although there exists difference of opinion regarding the time-span of this important stage of life, generally now a days 10-19 years of age is regarded as adolescence. Some important changes occur in the physique of adolescent boys and girls during this period. Adult persons, specially teaching professionals, are fully aware of these characteristics relating to the attainment of youth. So a detailed description and discussion is redundant. These biological changes give birth to some psychological reaction about which we remain either unaware or do seldom care.

These unknown and unexpected changes befall them as mystery. They fail to realize that this is a natural stage in the development of all human beings. Lack of prior knowledge generates a feeling of uncertainty and even of an unfounded sense of guilt. But they have no way to know the real thing. A frank discussion regarding private organs creates embarrassment among parents and other elder circle. Boys and girls also feel ashamed to enquire about this. They become rudderless with this repressed curiosity, their minds become unsettled, worn-out and morbid. In this position they search for other awareness of information. They start to talk among peer groups who are also equally ignorant. They become victims of delusion caused by wrong information and unscientific explanation.

This unsettled condition has a far-reaching harmful impact on their life-building process. To solve this problem the concept of sex education in school level took shape long ago and was introduced in several countries. The syllabi were more or less limited to the development of sex organs, reproduction and reproductive health. But later, experts realised that mere physiological knowledge cannot answer all the queries of the adolescents.

Besides the anxiety caused by the mysteries of physical changes, the mental world of the adolescents undergoes other changes that impair their social well being in later life. New developments appear in their desires and expectations. Their craving for affection, love, company, care and support becomes increasingly intense. This initiates mental gap with the parental sphere, but open new vistas of company and attraction for the peer groups. The

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loneliness of modern nucleus family heightens their agony & anguish. They naturally tend to be very sensitive. They want recognition as adults and at the same time can feel neglected or unwanted for trifle reasons. Adjustment with the family and other institutions poses a new challenge to their daily existence. In this period of attainment of youth, the attitude of the adolescent girls and boys towards their respective opposite sex starts to change. They start to develop a feeling of sexuality and sex-desire.

But basically, these are not problems. They are the signposts of growing up. If we can properly perceive and understand these changes, their desires, queries and anxieties and channelise them in the right direction, the young men and women would then be capable of developing the desired personality which would help them to lead a healthy and creative life. But any failure in this management will create a variety of problems for the individual and for the society as a whole.

Therefore, the need for incorporating in school curriculum the mental and social aspects of attaining adulthood with the same importance as its physical characteristics is now recognised. Through deliberations at International and National forum "adolescence education" has emerged as a more acceptable concept than "sex education". The main aim of this education is to build in the children of this age group a healthy attitude that will help them to lead a creative familial and social life. These relevant abilities are termed as "life–skills" and the institutional arrangement that combines these is called "life skills education".

The question of indluding sex-related education in school curriculum was raised in our country long ago. There have been prolonged discussions and debates but always with negative conclusions. In 1993, such a course was recommended for the first time on all India basis without sufficient initiative for its implementation.

NCERT took a clear decision that year for starting this course. But when it recommended the framework of national curriculum in November 2000, it did not suggest such a programme The Council only mentioned in the list of attitudes and abilities to be generated and promoted through curriculum, the point of "cultivating proper understanding of and attitude toward healthy sex related issues and respectful attitude toward members of the opposite sex "

Our established mindset considers sexual relation between men and women as an entirely personal affair. The age-old value system of our society is never in consonance with unbridled and unrestricted sexual relations. Pre-marital or extra-marital sexual acts and deeds are looked down upon as immoral and cause of a thoroughly depraved society. There is a sublime privacy in the relation between husband and wife, which we hold in high esteem. For that reason we feel hesitant to husband and wife, which we hold in high esteem. For that reason we feel hesitant to publicly discuss about sex. Naturally, male-female sex organs fall into that area of secrecy. If these topics are included in the curriculum & syllabi, then we have to write reading materials for them, to teach in the classrooms and we have to set questions in examinations all of which are incompatible with our adorable mindset and culture. Hence our uneasiness in conducing such an educational programme is quite normal.

The Present Urge

But society is not static; it undergoes metamorphosis through the dialectics of action and reaction between new and old. New situations are posing new problems and also offering new possibilities, inspiring various demands, slackening age-old value system, ultimately

reshaping the canons of the society. We are forced to shake off some long standing ideas, thoughts and habits.

The process of establishing womenfolk in their rightful place in the society by breaking the shackles of feudal norms has been initiated. Endeavour is on to expand their role in all social and economic walks of life. Consequently the intercourse and friendship among adolescent boys and girls, among young men and women are becoming much easier and natural than ever before. The conservative attitude and the superfluous and meaningless taboos are receding. This is obviously a healthy sign of social progress. But by taking undue advantage of this much needed transparency and freedom an impetuous, unrestrained, unbridled behaviour and life style are being provoked, primarily with an eye on business interests.

An atmosphere of open and unhindered sex enjoyment without any social discipline and code of conduct is being created in a planned manner. The waves of rootless culture that is engulfing us and seeking to direct our philosophy of life in the wake of globalization are adding enormous fuel to this degradation. A powerful block of the mass media is spreading this unhealthy trend in towns and villages through the length and breadth of this country. The essential message of this colourful daydream is that–the gratification of life rests with promiscuous and unrestrained sexual escapades. The most intimate pleasure of human life is being projected as a market commodity. At a time when our youth are victims of profound despair and are confused under the intense stress and strain of the prevailing socio-economic situation, such dazzling and alluring propaganda is leading them astray and rousing in them unhealthy curiosity and desire for foul experiments. The familial ties and social relationships are facing a big question mark. Promiscuity is raising its ugly head. An important and respectable section of the society is pleading for this waywardness in the name of individualism and trying to discard all the societal norms. This restive environment charged with excitement is giving birth to various types of individual and social hazards. We are panic-stricken by the rapid spread of the fatal drug addiction, incidents of unwanted pregnancy and above all, of AIDS. Now a days people in large number are inclined to shake off their conventional ideas and habits. They have come to realise that it is futile to try to conceal the messages that are being transmitted through filthy roots. So society's antipathy or resistance towards scientific sex related education is gradually on the wane.

Reservation nevertheless

It is true that there are some stirrings in the age-old attitudes. Still there exist some doubts among guardians and teachers in this matter. These have been reflected in a very well written article by Shri Jiban Kumar Mukhopadhyay published in the "Parshad Barta", the mouthpiece of West Bengal Board of Secondary Education, of December 2003. The salient features of this line of thinking are:

(a) The real motive behind introducing sex-education in school curriculum is to compromise with social depravity and shift the burden to young boys and girls. This proposal reflects the opportunist tendency of the adults. It seems as if they are telling their wards, "see, this is the situation. Now you manage it yourselves".

(b) The conspiracy to disrupt the social code of conduct about genital organs has become very strong in the present commercialised social system. In reality the adolescents are first bewildered by taking advantage of their lack of relevant experience. Then sex-

education is taken up as an attempt to set their minds at peace by some States dominated by business interests.

(c) The ultimate aim of this education is to quench the curiosity of the young adults and to make them aware of certain facts so as to enable them to be cautious about undesirable consequences. But there is an apprehension that in effect it might be counter-productive. This education has the potentiality to become a subject of distratction and spicy thought among the boys and girls.

(d) Inclusion of a new subject will increase the curriculum load and again the exciting topics of this heavy syllabus can agitate or perturb the delicate mind of the young students in the prime of their youth.

(e) Sex education in school is not an effective measure for getting rid of sexually transmitted diseases. Much more desirable is developing a social ethos with built-in stricture or censure on pre-marital or extra-marital sex so that the school students can shape and mould their values in this area along with their general value system in life.

(f) The family is the most effective training ground for human sex life. Due to various reasons that institution is disintegrating. But taking shelter under school curriculum as an alternative may produce the evil results of premature haste.

(g) The adolescents can learn everything about the marked changes of their body and mind without any inhibition from their parents. For this the need is not to educate the boys & girls, but their parents, so that they can act as a lighthouse for their wards.

The observations arrayed above obviously deserve close attention because they reflect the belief and attitude of many well-meaning people. With due respect to these arguments, the relevant consideration in support of the proposed programme are laid out below:

i) No one disputes that the derangement of the society and the State and the resulting decadence of culture and value system is the main problem.

The obvious reason of this degradation is market dominated society which in effect is bringing down our cherished human values and nourished social discipline and is endangering civilization itself. Symptoms of this malady are becoming palpable in every field of social life. The youth are being misled in a planned manner. In this situation almost everybody has become vocal about the need to change the society. Even NCERT, the central advisory organisation of school education, in its National Curriculum Framework published in November 2000, clearly stated regarding the general aims of education that "it (education) must also lead to a non-violent and non-exploitative social system" (para 2.5, P-39). But the change of society cannot be brought about overnight. That is a long-drawn and hard struggle. Even the necessary diffusion of consciousness in this regard has not yet made much progress. But at this moment we cannot turn a blind eye to the devastating effect of this degeneration. Had the social environment remained uncorrupted, if it were that the delicate minds would not be smeared with dissimulating crooked filth, there would be no need for the education system to take up this challenge. Alas! The situation is far from this. Quarters of vested interest are filling the air with venom. An indifferent and inactive education system would be held responsible for the inversion of the coming generation.

ii) The new programme which West Bengal Board of Secondary Education is going to

launch in consonance with the recommendation from West Bengal School Education Committee (2001-03), is not merely sex education. No new subject will be added except some new topics in the life science syllabus. The major chunk of this praxis would be through co-curricular activities. The main aim of this education is to create healthy cultural atmosphere by developing socially conscious personality enriched in values. In fact this proposal embodies an effort to integrate the essence of different aspects of basic education and some specific life skills with social values. It has not yet been possible to give the concept a clear shape and place it before the people. Hence the scope for misconception about the aim, features and pervasion of the subject.

iii) We are all anxious about the HIV-AIDS-Pandemic. There is no denying of this bitter reality. Some sections of the society have taken prevention of sexually transmitted diseases as the main aim of adolescence education and are propagating this idea with the tacit message that, "Do whatever you like, self-control or restraint have no place. Just learn how to avoid the disease." Definitely we are not going to toe that line of thought. That our programme has a healthy, holistic objective in view has already been mentioned.

iv) It is a common experience that for a variety of reasons the family school is dwindling. The economic forces have compelled us to adopt the small family norm. Yet it cannot be denied that this has given birth to some malaise. Family in most cases now compromises only parents who cannot provide ample company to their adolescent children, nor can they share their ideas, curiosity, passions and emotions. In majority of cases, they simply cannot realise what their wards actually need and want. Parents from the less privileged sections of the society lack even perception in this matter. They also need to be educated. But in this country of billions of adult illiterates how, when and by whom would that education be attained? Would it be achieved at all? Despite apprehension of some side-effects, the planned introduction of the programme in school seems to be the only alternative. The school students of to-day on attaining parenthood in the coming days would be able to fulfill the needs of the family school.

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PRESENT SYSTEM OF HIGHER EDUCATION : PROS AND CONS IN TERMS OF QUALITY OF EDUCATION AND QUALITY OF LIFE

Biswanath Roy *

Introduction

Education is a dynamic process. It aims to bring socially desirable changes in human behaviour. Education has become more and more of self-learning and self-management oriented by serving both individual and social needs. Here we can visualize a link between quality of education (QOE) and quality of life (QOL) for the development of life-instinct as against death instinct.

The objective of this article is to discuss the issues related mainly to higher education concerning quality of education (QOE) and quality of life (QOL) as having a probable cause-effect relationship.

The question however is, whether the present system of higher education is preparing the students through the present quality of education for a desirable quality of life. Quality of education may mean building up of the appropriate kind of values, self-concept, attitude, so that the individual can enter the World of Work for a vocation, for his own survival, maintenance and both horizontal and vertical growth. It is an effort for day to day living by fulfilling a heirarchy of needs starting from physiological to end at self-actualization.

The age group of students at higher levels normally range from about 17-18 to 23-24 year. They have to struggle to get the higher levels through the existing pyramidal system of formal education.

They enter into the bread-butter earning activity, either after completion of formal education or by dropping out earlier. But education does not stop here. What continues as a parallel system, is **convival education**, having a right wing ecucation (meant for the formal instutional education) and left wing (meaning education through non-conventional/non-formal systems). As a result, QOE becomes a subject of relative meaning.

Regarding QOL, lots of researches have been done. As usual, there had not been any good consensus regarding the semantic issues involved in it. However, one definition as linked with QOE for full and healthy QOL, emphasizes that all have to equally develop, so that, there is a healthy interaction between man's social well being, developmental opportunities and community systems as natural social ecology. Every individual will have opportunities to utilize all his natural gifts as well as exercise his democratic rights as a citizen of a country for developing his socially useful and creative potentialities. A group at the University of Toronto, once defined QOL as **Being** (Physical, Psycholgical and Spiritual), **Belonging**

* Formerly, Professor and Field Advisor (Eastern Region), NCERT.

(Physical, Social and Community Environments), and **Becoming** (Practical, Leisure, Growth related to achieving personal goals, hopes and aspirations).

Review of the past and present positions in higher education.

It may be interesting to note that development of formal higher ecucation in India was very slow initially, as may be evident in Table 1 below:

Table-1

Development of Higher Education (1781-1857)

1781 A.D.	:	Calcutta Madrasa was started		
1798	:	Banaras Sanskrit College		
1800	:	Fort William College		
1817	:	Hindu College (now Presidency College)		
1857	:	Three Universities at Calcutta, Bombay and Madras were started.		
2002-03	:	Central Universities	:	18
		Deemed Universities	:	92
		State Universities	:	211
		Inst. of National Importance	:	13
		Autonomous Colleges	:	148
		Total	:	482
		U. G. Colleges	:	15,437
		Total	:	15,919
		Student enrolment	:	92,27,833 (Total)
Women		Student enrolment	:	36,95,964 (40.05%)

In continuation, Table-2 will give indications about engagement of teaching staff of different categories:

Table-2

Number of and distribution of teaching staff - by designation in affiliated colleges (2002-03)

	Post	**Number**	**%**
1.	Professors (including Principals and Sr. Teachers who are equivelent to Professors)	22,550	6.20
2.	Readers (also. S. G. Lecturers)	81,469	22.40
3.	Sr. Lecturers	54,192	14.90
4.	Lecturers	1,90,544	52.39
5.	Tutor/Demonstrator	14,948	4.11
	Total	3,63,703	100.00

The two tables show the phenomenal growth of higher education within about 150 years since 1857.

Related Standards and other Criteria :

Certain standards were suggested by :

University Grants Commission (UGC) :

Apart from providing funds and coordination, UGC determines and gives guidelines for standards in the institutions of higher education through the following main steps :

(a) Standards of teaching, examination and research

(b) Framing regulations on minimum standards of education

(c) Monitoring developments in the UG and PG levels

National Assessment and Accreditation Council (NAAC):

NAAC was established in 1994 by UGC with the following objectives:

(a) Assessment is accomplished through a process based on self-study and peer review using defined criteria.

(b) Tasks include performance evaluation, assessment and accredition of Universities and Colleges.

(c) Objective and continuous improvement rather than punitive or judgmental, so that all institutions of higher learning are empowered to maximise their resources, opportunities and capabilities.

So far NAAC has graded the activities of 113 out of 482 universities and 2089 out of 15437 colleges.

The following seven criteria were considered by NAAC for the assessment procedure :

1. Curricular aspects
2. Teaching-Learning and Evaluation
3. Research, Consultancy and Extension
4. Infrastructure and Learning Resources
5. Student Support and Progression
6. Organization and Management
7. Healthy Practices

Education Commissions :

Several educaton commissions were also set-up to examine the quality of education vis-a-vis changes required. A brief picture has been given in Table-3 for the period 1947-1997.

Table-3

5-yr. wise distribution of Commissions and Commissions for Indian Education

1947-1951	7	1972-1976	7
1952-1956	9	1977-1981	7
1957-1961	25	1982-1986	7
1962-1966	16	1987-1991	5
1967-1971	11	1992-1996	4
		1997-	2

Total : 103

The main recommendations include (1) 2 or 3 yrs. for graduation with pass and honours courses. The PG courses remained for 2-yrs only, (2) review of pay scales and service conditions of UG and PG levels and (3) modification of educational management, for example, rotation method for headship of the departments etc.

Literacy Rate :

In addition to formal system of education, the National Literacy Mission (NLM) was also set-up to increase the level of literacy. The emphasis was on reading, writing and arithmatic only. The picture upto 2001 has been shown in Table-4.

Table-4

Literacy rate by Sex

Year	Female	Male	Average	Gap
1981	29.76	56.38	43.57	26.62
1991	39.29	64.13	52.21	24.84
2001	54.16	75.85	65.38	21.69

Literacy was linked to the socio-economic life of the people keeping eyes on certain main issues like (1) knowledge and education (2) need for training and follow-up action.

Expenditure on Education :

In the 10th-5-year plan (2002-07) the central government proposed to allocate Rs. 13,825/- crores (out of a total of Rs. 30,000/- crores) for secondary and higher education for both plan and non-plan activities. During 1990-91 the expenditure was 4.34% of GDP. Unfortunately, it came down to 3.8% of GDP during 1996-97 and now it is increasing with a target of 6.0% (approx). of GDP, in view of the Sarva Siksha Abhiyan (SSA) started in 2002 A.D.

Access to Quality of Education :

The structural and quantitative details given earlier in this paper, have indicated a gradual growth of the system till recent years. It will be out of place to conclude that such a growth indicates some growth in the quality of education, but has no accepted index of the level of quality.

Minorities Institutions Act :

Constitutional provisions for the minority communities have given them a lot of access to the governance of their institutions. Universities decide about syllabus, examinations for evaluation, publication of result, giving of certificates etc. But minority institutions on their own have full control over discipline, daily routine, quality of teachers and their accountability, admissions etc., which are very important for quality of educational development.

Joint Entrance Examinations :

These days students of various categories have to pass JEE, GATE, NET, SLET examinations for getting into higher and technical education plus teaching and research posts. The same is the case of Indian Administrative and allied services (IAS etc.) examinations. All these

examinations, have cast a big shadow over the quality of education imparted by all institutions of higher learning. Different types of evaluation systems of such examinations, have also created lots of problems leading toward mass copying, tampering of marksheets, fake degrees, mushroom growth of tutorial classes etc.

Incidentally, it may be noted here that, all these examinations, have different syllabuses to test the knowledge of the examinees. So, one may question the authority of the syllabuses of higher institutions. The qualities of education over here, have a big question mark on their merits and acceptance at a wider level.

In view of the above, three points and a few suggestions have been given below:

1. Private Universities Bill (1995) needs a thorough review against any misuse.
2. Model Act of Universities by UGC also needs a review by keeping eyes on the traditional growth of the academic institutions (more than century old ones) vis-a-vis the modern ones.
3. Review of the Sarva Siksha Abhiyan (SSA), started in 2002 and to link it with higher education.
4. Providing credibility and accountability of the UG and PG teachers by linking colleges and universities directly with NAAC and UGC recommendations and grants.

May be that, in such and unseen ways, quality of education may get not only a face lift but an impetus to grow further.

Access to Quality of Life :

Before this point is discussed further, let us look into certain other facts. They are :

Population Growth

The total population of India has already touched about 103 crores. This has created the biggest rush on the school education and a small number of them can come upto UG level and still smaller to the PG level. Needless but to mention that bigger attention has gone to school education while, higher education has remained static in terms of enrolment, grants etc. As a result, competition among the students have become more acute and stuffed with stress, tension and anxiety. The problem of school dropouts has added to the increase in child labour. Let me elaborate this point in relation to quality of life.

Child Labour

This is a creation of the general lower socio-economic standards of the related families. It has been noticed that convival education of the left wing type (non-formal and non-institutional learning experiences) serve their struggle for existence better than the romantic and theoretical learning in regular institutions. This has become a stuggle between unhappy vs. happy learning situations. Even free midday meal, dress, books etc. are failing to keep them in the school. Very recently, caste and religion have also entered the scene to disrupt the midday meal programme as causes of rejection of such meals. Higher values have no importance, when the struggle for existence carries no meaning without ready cash. Quality of life, over here, carries no impact of quality of education. In such situations, QOE and QOL have a romantic and impractical relationship only.

Unemployment, Wastage and Stagnation of Human Resource

Educated unemployment in the country has reached millions. so says the employment exchage figures. This situation has been created by a very passive self-esteem of the registrants amounting to serious dependency on the monthly salaried income as a solution for life and living. Also. this has become a trial method for acceptence - rejection modes depending upon the individual's own wishes.

One of the causes of wastage and stagnation of the human resource potential lies in the man power utilization aspect. There is severe dearth of skilled labour force both in terms of availability and institutional training facilities. For this. educationists have envisaged a wider application, which have taken off in big ways in small scale industries mainly.

As such, in these cases, quality of education has become detrimental to quality of life. A vision to improve one's socio-economic and cultural life and living, a vocation of one type or the other has created a route for QOL. It is to be mentioned here, that, the choice of vocation should not be socio-legally undesirable. It should have a higher value orientation at least for some link between QOE and QOL.

Interactive Responsibilities, Interdependence and Individual Excellence:

In a multidimensional society like India the patterns of responsibilities are not only interactive but interpersonal as well. It is a shared responsibility in social. cultural, economic and political fronts. A negative view may mean shared responsibility is no responsibility and the power structure has to be pyramidal and authoritarian. But in a society like Inida having thousands of years of experience in socio-political management the pyramidal power structure did not do any good. On the contrary, interactive responsibility has created a chorus making quality of life socially more useful and more creative. The concept of joint family life serve as an example. It gives an emotional umbrella where rights and wrongs, good and bad. agreements and disagreements, likes and dislikes and such other dyads, get into the paths of golden means for over-all acceptence. In reality this means management of main human emotions like love. hate, aggression. fear etc. Here quality of education has the responsibility of generating coping behaviour in the individual for better quality of life.

In fact, the subject of interdependence is very much well discussed. The moot point has been whether there can be anything like independence at all. It is in fact, always a matter of degree, whether it be economic, social, political etc. The concept has relationship with self-rule on personal matters. one's own desire, to take decisions about one's own affairs. But to fulfil such targets, one will have to depend upon another person, may be by dissassociating form another. It is shifting of redationships which is known as mainpulation of socio-personal distances. This however. is known as self-management. Even selfishness. ego-centric activities do come under self-management as it is related to the point of struggle for existence as well.

Coming to the point of individual excellence, it can be readily said than this is the culmination of a positive relationship between quality of education and quality of life. We can think of intellectual, social and moral dimensions to start with. What is socially desirable and acceptable constitute the main component of individual excellence. Unless the QOE creats the ground, QOL cannot grow by leaving individual excellence. Rewards are there, praises are given to individuals for excellence in one area or the other. But it starts with education.

All parents send their children to schools, colleges, universities to excel in education to start with. Then comes the professional life. But individual excellence requires individual efforts which depend upon self-concept, value, attitude and motivation. A sense of goal orientation, try for that and achieve that, can only give individual excellence. An individual is more important whether he is in a social matrix or interactive situation. It has been mostly found that individual excellence alone, be it in academic, sports, fine arts, performing arts etc. brings lots of recognition to every body. Group activities or team efforts also count. But these are also dependent upon individual excellence, but for the interactive responsibilities and interdependence, individual excellence is at times surrendered before the team or group efforts with honour for the contribution of others. For example, in academics, the present system does not so much encourage individual authorship of research papers but joint authorships may be even multiple ones. It is credit sharing which speaks about a congenial relationship between the authors, their quality of education and quality of life. Identity of the individual excellence in specific can exist alone. But when required team efforts or group efforts also get acknowledged and recognition does not get lost. This can happen only when QOE and QOL exist jointly not as a romantic and impractical dyad but as an absolute and happy reality.

Conclusion :

It may be concluded that the present system of education – its pros and cons in terms of quality of education and quality of life, needs more of intensive, practical and index oriented approach. It is a fact that QOE and QOL are related to each other and present education system has the responsibility to make it more symbiotic than ever before. Progress is there. But still has a long way to go before any tangible degree can be achieved in terms of both horizontal and vertical growths. We can always look forward for that and do our mite as will be required.

MODELS OF MEMORY

Pranab Kumar Chakrabarti *

Most of the readers from the disciplines of Psychology and Education teaching for many years at the undergraduate or postgraduate level may wonder why a topic like memory has been selected for a refresher course meant for them. In fact memory is one of the widely researched, elaborately discussed and largely debated areas in Psychology since 1880s but still it is one of the most unknown area in a sense that many of the theories are just untested models explaining only the tip of the iceberg. It may have been noticed by the readers that the title of the present deliberation is 'Models of Memory' not 'Theories of Memory'. It deserves a little explanation.

Model or Theory

A model is a set of principles or a combination of rules, principles or propositions that can or is used to explain large number individual events. Models have sound logical basis but may not have been tested under strict experimental conditions. But if models withstand the rigour of experimental verification and help to the deduction of further laws and principles it is called a theory. Thus models are inductively correct, empirically verified and accepted even if it fails to encompass all individual events. On the other hand, theories are correct both inductively and deductively. A true theory leaves no scope for exception.

In social sciences, true theories are very rarely established because most of these are only empirically verified. As a consequence there is always an alternative explanation of the individual events or counter theories opposing the original one. It is due to this reason most of the psychological phenomena are explained by a multiplicity of theories. Intelligence, Personality, Attention, Motivation or Creativity–in every field we encounter diverse theories. Memory is no exception.

The Early Models

The earliest models of memory are more descriptive than explanatory. Experiments on memory began even before those done by **Ebbinghaus** but all these were based on common sense description of the process of memory. We have a mechanism of **Registration** of the incoming information, then that of **Retention** followed by **Recall** and **Recognition**. Experiments were conducted mostly on retention and recall. Recognition was used as a manifestation of retention.

Contribution of Ebbinghaus to our knowledge of memory lies more in the stimulating effect on the researchers of his contemporary time and of the subsequent fifty years than in the indepth understanding of the process of memory. Apart from that his pioneering works on the experimental control of variables, devising very effective scientific methods and

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systematic approach to the study of memory provided a model that is followed till today almost unchangeably. Since memory is totally a mentalistic concept, the behaviouristic approach of stimulus-response orientation is inevitably the only feasible experimental method in memory research. Even the cognitivists of modern times cannot do away with the methods adopted by Ebbinghaus, though they differ in the interpretation of experimental results.

The major issues in the earlier models of research were, (1) role of introspection in the study of memory, (2) facilitators of or obstructions to memorisation, (3) effect of decay on memory or forgetting. (4) effect of interference (like that of retro-active inhibition), (5) effect of chunking on memorisation (part versus whole learning), (6) effect of variations in the physical characteristics of the material to be learned including length of the material, speed of presentation, (7) change in the sense modality (auditory versus visual), (8) meaningfulness of the material etc. The major findings, debates or controversies revolved round the establishment of the superiority, advantage, or efficacy of one over the other. But the question of understanding the process of memory remained largely unresolved until cognitivism dominated over behaviourism in the study of memory.

The Three Phases of Memory

There are three basic phases of memory–**Encoding, Storage and Retrieval.** Encoding is the process by which any incoming information is transformed into a retrievable memory code. Traditionally, the process of encoding has been termed as registration. Storage, obviously, is the equivalent term for retention and Retrieval for recall. Controversy remains about the fourth phase called recognition. It is true that unless the retrieved information is recognized it cannot be claimed to have been truly recalled, but the question is whether it is an independent phase of memory or just an integral part of the retrieval process. Logically, if recall is incomplete or meaningless without recognition then it cannot be an independent phase of memory. The second question that what is the position of recognition in the sequence of the phases of memory is also no less important. The sequence of the three phases is obvious but whether recognition precedes retrieval or follows it. Recognition cannot precede retrieval because in that case we would have always recalled the correct information. Also in that case recognition should be considered as totally an unconscious process. If recognition follows recall, then it is difficult to call it a process of memory. At the best, it may be called a monitoring system associated with retrieval. Again, our everyday experience says that in most of the times we recall an information so confidently that we rarely need any conscious recognition. It is therefore, safe to assume that recognition is an essential part of retrieval.

Recent Models of Memory

Contemporary models of memory put emphasis upon the understanding of all the three phases independently as well as their integrated functioning. They try to understand how an information is encoded for storage, how is memory represented in the long term storage and how it is retrieved. Analysis and comparison of computer memory and human memory provide many interesting clue.

While human memory is time oriented in the methods of storage, computer memory is list oriented. There is decay effect due to lapse of time on memory store and its retrieval in the case of human beings but in computer the serial order of information is more important. Again retention in human memory is graded. Some of our memory store are fresh and vivid

while others are faint and indistinct. In the case of computer either a memory exists or it is totally deleted. In the memory parlance efficiency of retrieval is measured by the bits of information that is recalled per second which is low for human memory but quite high in computer. Thus retrieval is fast or super fast in computer in comparison to human memory. In fact, to many people, it appears puzzling as to why some past experiences are recalled immediately and some others prove to be difficult.

Memory capacity in human beings may be amazingly diverse ever increasing with experience while computer memory is independent of experience. Computer memory capacity is fixed and measurable in terms of bytes. For retrieval, human memory is dependent on the context under which the information was stored, conversely computer memory is independent of any context. We may need to recall the place where we met a person just for recalling his name, computer will always recall the name directly and independently. Human memory requires and can do the recognition function which computers can do in limited way if it is programmed to do so. For example, a computer will recognize and reject the American spelling of English if it is programmed for British spelling. An Indian name will be recognized as wrong since it is not within its memory store.

Informaiton Processing Model

Atkinson and Shiffrin model of information processing is the most well known and widely read model of memory in which, three stages have been hypothesised. The first stage is called **the Sensory Memory.** It is of very limited capacity and very short duration. There are separate memory systems working in the sensory memory, namely, **Iconic** memory for visual information, **Echoic** memory for auditory information, **Haptic** memory, and so on. The second stage is called the **Short Term Memory.** This is a temporary storage system and work space for information processing meaning that the incoming information is manipulated, screened and transferred to the long term storage. As for strategies of information processing, there are **Simple Repetition, Maintenance Rehearsal, Elaborative Rehearsal** or the similar other techniques which are given a common name called **Surface Processing** of information. For enduring long term storage deep processing of information is necessary. Some common examples of deep processing are Classification, Categorization, Relating to past experiences etc.

Long Term Memory, the permanent storage system of information, is the third stage in the information processing model. Strategies of information processing mentioned earlier ensure long tem storage. The most accepted model for the storage system in the long term memory is popularly known **as Network Model** which emphasize that the schema in long term memory are so interconnected that they form a network of information that goes from very specific information to more generalised system.

Network model of long term storage begins with the object name at the base or bottom level meaning that children at first learn to identify an object by name. A single object forms a prototype (**Eleanor Ross**) representing a concept or a schema. When two or more such concepts are found to have some common elements or attributes, they are combined into more generalised concept. These in turn, may contribute to the formation further generalised concepts ultimately assuming a pyramidal structure of the net work of concepts. Net work model is considered to be more applicable in the case of semantic memory coding. In our long term storage memory is stored in a certain order or pattern. In one sense, net working of information is a kind of cognitive mapping.

Encoding in the Short Term Memory

Another model was suggested by **Allan Paivio** which is commonly known as the **Dual Coding Model.** According to this model, memory store is represented in our long term memory by what is called **Imagery**. Thus any stored information is represented in the form of images For sensory information images are more vivid and concrete. Abstract concepts have relatively weaker imagery. Visual information forms the most vivid imagery but when a separate but interconnected semantic code is associated with sensory imagery, information gets the most enduring storage with easy accessibility. According to one group of psychologists, processing of information in the short term memory is no more than encoding depending on the nature of sensory input received. We have Acoustic codes for auditory information, Visual codes for the visual information or the like. But semantic code always strengthens the sensory codes when it is to be transferred into the long term memory. How is information encoded and stored is best demonstrated by the experiments conducted by **Craik and Tulving.** They noticed that when only visual code is used (say, type case of the word to be memorised) retrieval rate is minimum. When the acoustic code is used the rate of retrieval improves (say, when due attention is given to how does the word sound like, while reading). But when semantic code is the prime mode of storage, retrieval is maximum (say when the word to be memorised is classified on the basis of some inherent attribute). But in any case when there is a question of negation, encoding process is retarded.

For serial learning of information in which order of the incoming information is most significant, the retrieval shows either **Primacy** effect or **Recency** effect. We recall easily those information which is given pre-eminence and also those which are recently learned. In an immediate recall test of memorised words the last part and the first part are more easily recalled than the middle part due to recency and primacy effect respectively.

Encoding for Episodic Memory

Distinction is often made between our memory about general information of the world around us, all varieties of procedural memory and about the information of personal events. Two models are suggested. In one model cognitive mapping as the outcome of early spatial development has been emphasized. Cognitive mapping of space is initially concerned with the mental representation of the physical space. But in the long run, cognitive mapping refers to the hypothetical space along which the episodic memory is stored in an orderly manner which can be traced at the time of retrieval with easy accessibility.

Models of Everyday Memory

Most of the models of memory mentioned so far, provide a general scheme of memory system. To many people, the mystery of every day memory still remains unresolved. Retrieval of an information in everyday activities is almost automatic but sometimes not at our command. Particularly in everyday memory we have to handle infinitely diverse types of information. How are these stored, managed or represented in our memory, is still a mystery even to many researchers in this field. In the Tulving's (1991) opinion, there is no singly entity corresponding to everyday memory. What is termed as everyday memory is in fact a kind of cooperation and interaction of different cognitive and behavioural subsystems. Thus when we execute a function, the motor activities involved, physiological conditions at the time the activity is executed, cognitive resources employed during the action all are synchronised in

a certain manner. This has been termed as the cooperation and interaction of the subsystems which are registered in our long term memory and subsequently monitored whenever necessary in future.

Criteria of this interactive subsystems may be briefly presented as follows:

- There are different functions for different information.
- Different systems may employ different processes.
- Different systems are mediated in different brain structures.
- It is likely that in the course of evolution all the systems appeared simultaneously. They developed at different evolutionary stages.
- These systems do not have a single category of mental representation rather different systems have different mental representation in memory.

Tulving thinks that there are five different systems for everyday memory. These are (1) Procedural memory for skills, actions and simple conditioning, (2) Short term memory, (3) Semantic memory, (4) Episodic memory, and (5) Perceptual representation system involved in perceptual priming of identification of objects.

Johnson's Multiple Entry Modular Memory System

According to Johnson's model, there are only three subsystems in the everyday memory, namely, (1) Sensory system, (2) Perceptual system, and (3) Reflective system. But the entry of information in these subsystems may occur in a variety of modules at different levels of encoding and the retrieval will be affected accordingly. According to Johnson, the characteristics of everyday memory are to be explained separately for each stage of memory process.

Encoding characteristics of everyday memory have been stated to be selective and elaborative. This implies that not all the information in everyday experiences are necessarily encoded and in other cases the information are encoded elaboratively. On the other hand mental representation of memory store for everyday memory are four. Firstly, Mental representation is dynamic. It is integrative and is able to form hypothetical representation. Also in the representation of everyday memory it is possible to store both central and specific informaition. There are two retrieval characteristics that ensure both implicit and explicit retrievable memory. Interested readers may consult the comprehensive work of **Gillian Cohen** (1996) named **Memory in the Real World.**

ANATOMY OF ENVIRONMENT AND EMERGENCE OF ENVIRONMENTAL SCIENCE—AN OVERVIEW AND INNERVIEW

Naresh Chandra Datta *

Environment, Ecology and Environmental Science are the buzz words in recent times. Nearly some decades back very few persons excepting some conscientious environmentalists, farsighted philosophers and ardent humanists bothered for environment. But as a result of mass scale ecodegradation which is threatening the very existence of man and biosphere, we have not only become concerned but also scared about undesirable changes in the quality of our environment caused by human intervention. A small book entitled, "Silent Spring" written by Rachel Carson in 1962 did a big job by creating mass awareness at the global level about the vulnerability of environment caused by persistent pesticides. A decade after, the first UN Conference on the Human Environment was held in Stockholm in 1972 which brought global environmental issues into limelight. Subsequently, in 1992 United Nations Conference on Environment and Development (UNCED) was held in Rio, Brazil which gave a clarion call for the preservation of environment and conservation of biodiversity. Again in 2002 World Summit on Sustainable Development was held in Johannesburg, South Africa, to discuss environmental problems and the problems of development. However, let me now define, explain and interpret Environment, Ecology and Environmental Science in the present day perspective.

The UNCED (1992) document comprises following five separate argreements :

1. The Framework Convention on Climate Change.
2. The Convention on Biological Diversity.
3. The Rio declaration.
4. The Forest Principle.
5. Agenda 21

Environmental Defined (Fr. *Environner : environ* – around, *virer* – to turn around): Environment, according to common man's perception means just surroundings – a nontechnical term, which does not communicate the depth and dimension of the term in a technical sense. Precisely speaking, an organism's environment consists of all those substances and forces external to the organism that enter its reaction systems or otherwise directly or indirectly affect its maintenance, growth and reproductive functions. From ecological standpoint environment comprises two discrete and distinct components : (a) **habitat diversity (abiotic**

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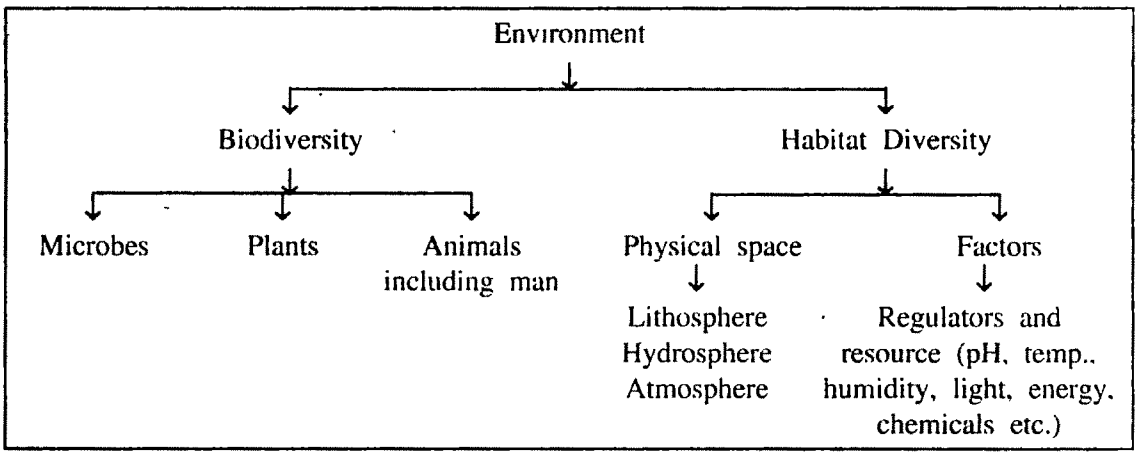
part) and (b) **biodiversity (the biotic part)**. Habitat diversity includes the physical space (e.g. lithosphere, hydrosphere and atmosphere) and the factors (e.g. temperature, light, pH, humidity, energy, chemicals etc.) which regulate the ecosystem processes. Biodiversity is one of the most important catchphrases of the third millennium. It includes the diversity of biota in its totality from micro to macro level.

Anatomy of Environment



Ecology Defined : Ecology is rapidly emerging as an exciting and indispensable academic enterprise in recent years. Although ecology is as old biology but for reasons unknown its progress has been very tardy. Probably Hanns Reiter first combined the Greek words *oikos* meaning "home", and *logos* "the study of" to form the term ecology in 1865 (Kormondy, 2000). A year later in 1866 Ernst Haeckel also used the term ecology. In 1879, Haeckel precisely defined ecology as stated below :

> "By ecology we mean the body of knowledge concerning the economy of nature– the investigation of the total relations of the animal both to its inorganic and to its organic environment, including above all, its friendly and inimical relation with those animals and plants with which it comes directly or indirectly into contact – in a word, ecology is the study of all the complex interrelations referred to by Darwin as the conditions of the struggle for existence".

In this context some more terms tangential to ecology may be mentioned. French zoologist Isodore Geoffroy St. Hilaire introduced the term **ethology** for the "study of the relations of the organisms within the family and society in the aggregate and in the community". St. George Jackson Mivart coined the term **hexicology** (which is almost abandoned) to depict the study of the relations existing between the organism and their environment and also the relations among the organisms themselves. **Sociology** is also akin to ecology which according to Kendeigh (1974) encompasses the ecology and ethology of mankind. By their own merits both ethology and sociology are now developed as distinct disciplines.

Origin and advancement of ecology : The Western Historians of Science consider Greek Botanist Theophrastus (380-287 B.C.) as the father of ecology. But it is rather difficult to substantiate their claim for obvious reasons. An introspection readily reveals that long before Theophrastus, the idea of ecology was there in the early Hindu literature although ecology as a term was nonexistent. Of course, before the coinage of the term even the primitive people

were conscious of the beneficent bond between man and nature. They did have common knowledge, ecological in outlook, about plants, animals, air, water, soil, sun (solar energy) etc. Virtually, as an academic discipline, ecology started as **Natural History** which provides an interesting account of the broad observations on the life and living of organisms in the perspective of environment. At the beginning, floral and faunal exploration with special emphasis on taxonomy formed the core of ecology. Very ofter biotic components and abiotic parameters of environment were studied in segregation and the relationships between them remained almost unexplored. However, subsequently ecology became more analytical and relationships between organisms and environmental factors were highlighted in a critical manner. This is **classical ecology** as enunciated by Ernst Haeckel (1870). During 20th Century, the relevant principles of physics, chemistry, geography, geology, statistics etc. were applied in ecological research. Thus, emancipation of ecology from narrow boundary of biology took place. The status of ecology was thus elevated and it became an indispensable branch of science being at par with the other branches. With the enunciation and application Ecosystem hypothesis by Tansley (1935), ecology became more enriched with the unifying concept which forms the core of ecology. Thus, **modern ecology** as we may christen it, came into existence. Modern ecology by and large is the product of last five decades or so. Datta (1990) defined ecology as "a branch of science or rather a discipline of human knowledge dealing with the strategies of survival of man and biosphere in space and time."

Emergence of Environmental Science : Probably, Enviornmental Science is not a new science. Is it a new name of the old ecology? (Old wine in new bottle! Or both the bottle and the wine are new!). It is rather difficult to give the final verdict. Very likely the term Environmental Science came into use after the first U N Conference on Human Environment held at Stockholm in 1972. Of course, who first coined this term is not known. During last quarter century there has been a paradigm shift in the content and concept of ecology which probably necessitated a new christening of ecology so as to incorporate emerging ideas. In this context, the revealing remark of Southwick (1976) may be quoted. He states, "Rarely has an academic subject become such a major issue in the public consciousness as ecology in the late 1960s and early 1970s. Within a few years ecology progressed from a rather quiet and obscure branch of biology to a subject of national and international concern. Education, business, politics, law, agriculture, engineering, medicine, public health, and even international affairs were all affected by the sudden upsurge of ecological and environmental concern". In keeping with the contention of Southwick Barrett (1985) expounded the "NOOSYTEM" concept to integrate biological, physical and socio-economic parameters within a framework of holism. Datta (1990) also stated that "ecology has now gained a rank of a synthetic science, multidisciplinary in nature and boundless in its concern due to immense input from various areas of human knowledge. Although basically ecology is biological in its marrow but it has now become a social science for commoner to elite". **I feel that socialisation of ecology has taken place to a great extent and therefore ecology deserves a new name and I also feel that the term Environmental Science may be meaningful until a new and more appropriate vocabulary is found out.** Centainly it is not a new species of science and its evolutionary sequence may be outlined as stated below. Natural History→Biology→Classical Ecology→Modern Ecology→Environmental Science.

Dictum of Deep Ecology : In recent years many new ecoethical ideas are emerging and deep ecology is one such concept. The germ of the concept of deep ecology may be found

in the writings of Nathaniel Shaler (1905) who emphasized the "need for the development of a new ethical relationship with the natural world that would protect the Earth and all its creatures, including man". The living creation is far from being man-centered and it is rather biocentric and is emphasized that man should refrain from "claiming gross superiority over the rest of the natural world".

However, the term deep ecology owes its origin from the writings of Norwegian phiolosopher, Arnie Naess (1972) who stated that shallow ecology is concerned with apparent environmental problems like pollution, soil erosion, cultural eutrophication, resource depletion etc. Deep ecology, on the other hand, deals with deeper roots of ecological problems and proclaims that the richness and diversity of all life on earth has intrinsic value and all life on earth have the exclusive right to exist regardless of its utility for human purposes. Naess also visualized a deeper concern of ecology with the structure and purposes of the society which is tangential to the "principles of diversity, complexity, autonomy, decentralization, symbiosis, egalitarianism and classlessness". Despite deep ecology emphasizes the protection, preservation and restoration of environment in its totality which is although a noble task of human kind but it fails to address the socio-economic and political problems of environment of the present day consumer society. **In my opinion obstinate anthropocentric attitude, ruthless egocentric behaviour and all-out oligarchic temperament of man are the root causes of present day ecological crisis.** In addition to these, the exponential growth of human population is adding fuel to the fire. Therefore, a compatible synthesis of the ecoethical concepts which will establish the balance among preservation, conservation, population growth and utilization of natural resources in the sustainable manner, is the need of the time.

Epilogue : It is now understood that man is totally dependent on environment not only for his survival but also for his continuance. In order to maintain the sustainability of clean environment I suggested the following set of ten golden rules which has already been christened as **New "Ten Commandments"** (Datta, 1990). Be it understood, that the **Ten commandments** are the ten laws which were proclaimed by God to Moses on Mt. Sinai.

- Man's place and role in nature should be re-examined.
- Man should refrain from making large scale transformation of environment without proper environmental impact analysis.
- Man as a part of Earth Watch Programme should ensure that the fate of the "global commons" does not end in the "tragedy of the commons".
- A balance between population growth and resource utilization should be established
- The gaps between the rich and poor, between the developed and developing countries as well as underdeveloped countries should be narrowed.
- Equitable distribution of resources to all for rightful use should be allowed and needful conservation of vital resources should be practiced.
- Essential ecological processes should be allowed to continue in time and space without any impediment.
- Abuse and misuse of resources should be avoided and wastes should be recycled as far as practicable.
- Man will have to develop a profound respect for Nature.
- Man should remain altruistic.

World Conservation Strategy (Formulated by IUCN, WWF)

- Maintenance of essential ecological processes.
- Preservation of genetic diversity.
- Sustainable utilization of species and ecosystems.

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ENVIRONMENTAL EDUCATION AT THE SCHOOL LEVEL

Jyoti Prakash Ghosh *

Why environmental education?

There can be no debate regarding the necessity of environmental education at all the levels of education.

All of us do know that the environment at various parts of the globe has already degraded and is being degraded to such an extent that unless a wide awareness is aroused among all, besides appropriate measures that are to be taken up at the national and international levels, our blue planent will be in danger and our existence will be at stake.

The air, water and soil are getting seriously polluted at different parts of the world, due to an increase in the amounts of carbondioxide and other green house gases in the ambient air, there may be a danger of an increase in global temperature resulting in melting of polar ice-caps and the floating ice-slabs of the oceans, ultimately leading to the possibility of low lands in different parts of the globe particularly in the coastal regions being flooded. Ozone-layer of the atmosphere being depleted particularly in polar regions due to attack by dangerous chemicals, the possibility of harmful ultraviolet rays of the sun falling on the surface of the earth is increasing. As a result, the cases of skin-cancer and cataract of eyes among persons residing in the adjoining areas are going on increasing.

On the other hand, both the irrenewable and renewable natural resources of the earth are being depleted at a rapid rate. The forests being destroyed at random, the possibility of an expansion of desert-areas, soil-erosion, a short rainfall is ever increasing. Due to population explosion and rapid urbanisation, there is a contraction of cultivable land area. The fossil fuels of the earth being rapidly depleted, the energy crisis is being continuously aggravated. The various eco-systems being disrupted, many species of flora and fauna are endangered, some in the meantime are no longer in existence.

So many and other problems are cropping up in the environment at all levels–local, national, global.

It is to be mentioned in this connection that the major part of so many environmental problems has arisen during the last sixty years or so in our planet, which is in existence for more than 4500 million years. The main reasons behind this are (according to U. Thant, Ex-Secretary General of U.N.O.): Rapid population-growth, rapid urbanisation and wide application of technology and all these conducted in many cases in a somewhat unplanned manner.

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Anyway to protect the global environment from further damage, appropriate actions must be taken at the international and national levels (on the basis of recommendations of international conferences on environment, held from time to time) on one hand and on the other, a wide awareness of environmental issues among all the persons will have to be aroused through all possible avenues.

How should envoronmental education be imparted?

So far as imparting of environmental education at the schdool-level is concerned, there is a debate, over how this subject is to be included in the curriculum. Should it be introduced as a distinct separate subject or should it be studied alongwith other topics included in the syllabuses on some specific subjects ? There are other points of debate also.

First of all, let us try to identify the approaches through which such education may be inparted. Some of the methods may be

1) Study of Environmental Education as a separate subject.
2) Identification of suitable plug-points in some topics included in the syllabuses of relevant subjects and furnishing environment-related ideas therein
3) Through well-planned co-curricular and extra-curricular activities including some projects of Environmental issues.
4) Through all these methods.

It can be remarked that the approach, method and the content of environmental education will obviously depend on the particular level of education, e.g.

a) At the primary level, environmental education should be mainly based on activities particularly for the students of classes I & II and both the physical and social environment should be studied in an integrated manner.
b) For classes III to V study on physical environment may be conducted through natural science, while study on the social environment may be through history & geography or social studies.
c) Environmental activities may also be taken up under other subjects, such as Health & Physical Education (or Art of healthy & productive living), SUPW or creative and productive work.
d) Through language/literature, mathematics etc. also environmental ideas may be disseminated.
e) Besides, from Class III onwards, small projects relating to both the aesthetic and hazardous aspects of the local/immediate environment may be taken up.

For the upper primary classes, alongwith the previous methods, additional components of environmental education may be plugged in suitable points of the syllabus-content of relevant subjects (such as science or physical science & life science, geography, history etc.). The languages/literature, mathematics etc. can also be utilised for imparting environmental ideas through incorporation of suitable pieces on environment (in case of languges) or through presentation of environmental ideas/problems in the form of mathematical problems.

At this stage of education, project-works relating to environmental problems and their possible solution, must have to be taken up.

The issue of imparting environmental education from Class IX onwards becomes somewhat more debatable regarding the procedure of imparting such education - environmental education as a separate subject or through plugging components of such education in suitable areas of the content of some relevant subjects.

Regarding the procedure to be followed the matter may be left to the respective states, but some minimum essential components of environmental education may be chalked out by the NCERT which should be adapted or adopted by the states. A careful scrutiny for introducing environmental education as a separate subject is often called for. Enhancement of the existing curriculum load is considered not desirable. The difficulty in appointing subject-specific teachers immediately is also to be reckoned. In view of all these our considered opinion is not in favour of introducing environmental education as a separate subject The elements of environmental education that already exist in the syllabi for different subjects, particulary those in geography, life science and physical science should be upheld with due priority without any dilution. Topics relevant to the existing points in the syllabus (plug points) may be fit in. Subject teachers may be given a short-term orientation so that they can deal with the topics relevant to environment education in the class.

At the +2 stage of education also, it would be better if environmental education could be introduced not as a separate compulsory subject so that the students belonging to various disciplines - arts, science, commerce etc. are not overburdend with curriculum load. This, as a matter of fact, will not deprive any section of the students of having such education.

After status study of the syllabi for different subjects, the plug-points and topics may be identified.

They syllabus, at this stage, may be prepared by the NCERT making allowance for its modification by the states to adapt the same according to their need.

Some suggestive components/content of Environmental Education

- The components of environmental education would naturally vary according to the levels of education, but there should be some core-components. At the primary level, education about the environment and through the environment parts should be emphasised on, not ignoring altogether, however, the education for the environment part.
- The last part is to be given more and more emphasis gradually from the upper primary to the higher secondary (+2) stages.
- Both the social and natural aspects of the environment i.e. the environment in its entirety to be included in the syllabus for all the levesl of education and both the hazardous and aesthetic aspects of the environment are to be reflected in the syllabuses.
- All the three types of hazardous aspect of the environment, viz. environmental pollution, conservation of natural environment and depletion of natural resources are to be highlighted.
- Necessity of maintenance of balance of eco-systems—both natural and social—is to be emphasized (i.e. "learning to live together" is to be laid due importance).
- Main objectives of environmental education at each of the stages of education are to be clearly stated keeping in view the local, national and global issues. etc.

Outlines of suggestive syllabus - content of environmental education to be fitted in the existing plug-points as a part of different subjects at the +2 stage are placed below:

1. Environment—its meaning & definition, biotic and abiotic components, various environmental hazards and their roots. Some environmental disasters.
2. Eco-systems—Problems of their sustainability and rupture. Forest-eco-system, social eco-system.
3. Population and Environment : Impact of rapid growth of population, poverty, affluence and consumerism and the environment. Sustainable developments.
4. Natural resources : Renewable and irrenewable, depletion of natural resources, scarcity of water, common energy sources and energy crises, unconvenetional sources of energy.
5. Environmental pollution : Pollution of air, including acid rain, smog, green-house effect, depletion of ozone-layer, water, soil pollution and loss of its fertility.
6. Impact of environment on public health : Environmental pollution and public health, some air-borne & water-borne diseases, abuses of unjudicious wide use of pesticides, inorganic fertilisers etc.
7. Environmental acts, ethics and some public movements on environment.

Evaluation

It is no denying the fact that ours is a system of education mainly based on examination. As such, in order to make the environmental education meaningful and effective, expected learner-competencies on the subject must have to be adjudged both through internal assessment and through external or public examination (in which stage where such an examination is conducted).

In case of public examination at the stage where environmental education is not offered as a separate compulsory subject, but is offered as part of some relevant subjects a certain percentage (say 5%) of the total marks should be allotted to the environment-related questions answering of which should be made compulsory (so that all the examinees are to answer those questions).

There may be evaluation of the entire planning (including that of the syllabus) in this regard from time to time so that necessary corrective & appropriate measures can be taken up.

In fine, we think that the ultimate decisions to be taken up in all these regards are to be left to the respective boards/states so that the planning of imparting environmental education may be meaningfully implemented with utmost sincerity from each and every corner.

EDUCATIONAL MANAGEMENT-AN OUTLINE

Priyatosh Dutta Roy *

Wood's despatch (1854) laid the foundation of present day educational system in India. As it was a govt. initiative, the concomitant administrative structure was also created. In course of time secretariats, directorates, district inspectorates etc. also came into existence in hierarchical order. Acts, rules and regulations were framed to run, educational institutions according to govt's desire. The education system developed in the British model, but inspite of the use of terms like autonomy, grant-in-aid etc. the iron-cage of administration and supervision remained intact. Within this iron cage, great thinkers & leaders of this country established educational institutions for the people. Thus the system grew but the iron cage was never modified or renewed.

After 1947, the size of the education system grew manifold.

Indian year book - 2005 G.O.I.

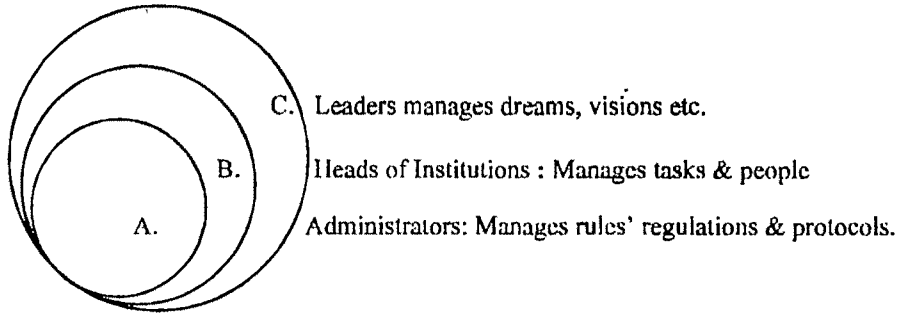
Table 1 : The size of educational enterprise in India.

Primary Education	**Secondary Education**	**Higher Education**	**Autonomous research organisations**	**Supporting authorities**	**Non-formal**
1. 86th amendment 2002, elementary education made a fundamental right for children (6-14) years	Central –1700 State – –105.000 Private – –5,000 1,11,700	1. 16000 colleges 2. 306 university level institutions 3. Number of students –88 lacks No. of teachers –4 lacks	ICHR ICPR IIAS ICSR ICSSR NCRI H-History P-Philosophy A-Advanced S-Science S-Social Science R-Rural	SSA DPEP NCTE NCERT UGC AICTE MCI NIEPA	1 Adult Education (N.L.M.) + (T.L.C.) 2. 10 +1 Open Universities 3. Open Schools.
2. Addresses need of universities 192 million children in 11 lack habitations.					
3. All come under (SSA.)					

The table shows the size of the system now. It is bigger than the railways, any Indian MNC or even the armed forces. This system cannot run by old principles. M. Mukhopadhya the director of NIEPA has classified the point with a simple diagram.

* Professor (Retired), Department of Education, Kalyani University.

Figure 1 : Workspace of Administrations managers & leaders.



(Source : M. Mukhopadhya : Leadership for institution building).

In India the first circle is dominating. The people there, are highly educated & competent but over burdened with rules, regulations & protocols. The second circle is crowded with persons as institutional heads who hold teachers, students & other personnel with one hand and the administration with the other. Ultimately the latter consumes all their energy and they are reduced to stereotypes. In the days of globalisation when visionary leadership counts most, such state of affairs is simply untenable. So in the third circle are the teachers who have the responsibility of implementation are the only hope. Unfortunately, the whole teaching process is geared to help learness pass examinations and teachers also have reduced themselves to stereotypes, caring only for snippets of knowledge with which he is concerned. This inertia on their part is difficult to overcome. But it is a "do or die" situation. The writer believes that if teachers can take hold of two aspects in firm grip, the objectives of education can be achieved. The first is adopting management techniques and (2) the second is educational technology as the tool of improvement of standards.

We are somewhat squeamish about the term management. We think it is for big business, who exploit labour and make profit. But its meaning is entirely different. There is management everywhere, informal or formal. A family or a club has informal management. The moment one crosses the threshold of a household, he is aware of the management style of the seniors of the household. The same is true of other organisations also. Big organisations require formal management, others go by informal and the govt. goes by administration & supervision.

Let us begin from the beginning. What is management ? [Koots (et, al.) Essentials of Management Tata, McGraw (1998)]. "Management is defined as a process of **designing & maintaining an environment** in which[1] individuals working together in groups efficiently accomplish[2] selected aims". A careful scrutiny of the definition will show up three aspects of management the first "designing and maintaining an environment". Environment consists of human relations because management entails management of human beings. The second "individuals working together in groups" means organisations. Organisations are collectives with objectives to attain. If there are no objectives, organisations become crowds. Organisations with stability and value dimensions become institutions. In the group the role of each individual is clearly stated. The third "selected aims" are different for different organisations Business organisations have profit maximisation as their aims. Private organisations even in education, has the same aim. But in public institutions, particularly in health and education, the selected aim is "maximum welfare" which is now a measurable quantity.

Keeping in view the above definition we can turn our attention to the application of management techniques to education. Management theory is based on five pillars, viz. objectives, planing, organising & staffing, leading & controlling.

Aims & Objectives :

Aims & objectives in education are very eassy to formulate, but very difficult to come to a unanimous decision. Education by definition, is an activity i.e. the activity to help the child grow into a man. Who is "ideal" man is a question which is often mired in philosophical arguments Education is not an activity to be engaged in endless philosophical arguments, but it is to handle learners reach objectives. The best course is to refer to UNESCO. The book "Learning : The treasure within" gives a universal consensus on the objectives of education. The book elaborates that in the present day world of globalisation education needs four objectives : "to know", "to do", "to live together" and "to be". These four can be put together in a taxonomy, curriculum transaction, evaluation. Teachers will immediately protest that they have the pedagogy for the first two and not the last two. Here they require to be innovative and aware of educational technology, to which we shall come later. Now, knowledge is the sine-quo-non of education. But knowledge crammed into the head, is dead wood. If must be manifested in the learner's behaviour. So "to know" accompanies 'how to know'. Similarly 'to do' is not fancy activity but knowledge based 'productive' activity'. To 'live together' is based on knowledge that it is a 'necessary' condition for survival of human beings on this blue planet. The core of live together is empathy not sympathy. "To be is a question of self realisation which will spontaneously grow into a world outlook, if the other three objectives are attained. All reflective teachers know that a new pedagogy is gradually emerging.

While the quest for new pedagogy continues the current pedagogy can be suitably modified.

Planning :

Elaborate planning of space, time and equipment is the blue-print upon which the educational system is to stand. There is a perpetual problem of space. Keeping in view table no 1, one can realise the enormity of the problem. Fortunately, we live in a tropical country, where nature is a friend & not an enemy. Time is also a difficult question which follows the former. Most of our students in the formal system of education are day-scholars at the school level and commuters at the higher education level. It is difficult to extract 5/6 hours' of class-room contact between teachers & students. It is also difficult to get even 200 working days for schools & colleges. Teaching is a special type of communication between teachers & students. It can be verbal or non-verbal. So, over and above formal class-room communication, non-formal, verbal as well as non-verbal communication need to be added in teachers kitty. Innorative teachers do this already. There is immense scope of the above stated type of communication which has not been tapped to its full educational potential. With respect to equipment, we come to the concept of technology. Technology is the knowledge of tools and techniques which a people use for changing the environment in their favour. When a caveman first used two pieces of flint to produce fire, it was the birth of technology. Similarly, when the Eskimo builds his iglo, he uses technology of his time. There is low technology and high technology–simple & complex. Complex technology is necessarily based on knowledge. In the history of education, we find the simple technique of teaching in the oral

tradition of verbal communication. Then came class-rooms, BB's, chalk & talk, labs etc. Now virtual class-rooms can be created for communicating with the best of teachers. So a teacher has a range of technology in his repertoire. It is upto his ingenuity, enterprise and innovative spirit to find out the most suitable depending upon its local availability. In the second half of the last century immense development has been made in teaching tools & techniques.

Organisation & Staffing :

Organisation means identification and fixation of roles for the available personnel. Here again, the shortage of members will show up, as everywhere in a developing economy. Still there is no respite and no scope for splitting hair & grumbling. Even in competitive games these days, the roles are very defined. Nearest analogy is a cricket team. From the first member to the last, roles are defined. At the same time the players work as a team. Building teams are an important aspect of organisation. In the lower level teams can work easily. At the higher levels, there is the system of subject teachers. But subjects are losing there boundaries these days. Amartya Sen travels from philosophy to linguistics, though his core subject is economics. Students of professional institute are required to offer at least one semester to the humanities. Right person for the right job is the basic of good staffing. If all the members of the staff take part in the management of the institutions for maximum welfare to the learners it is believed that a break-through will be made.

Leading :

Quality leadership is the crux of management. Krootz (1998) in a diagram of a rectangle shows the place of leadership among the four pillars of management, by the area covered by each of them.

Figure-2 : Distribution of area according to importance.

Planning	Organising & Staffing	Leading	Controlling

Mukhopadhya criss-crossed the whole country and studied the qualities of leaders who pulled institutions up from disaster to excellence. The qualities as enumerated by him are as follows:

Table-2 : Leaders who build institutions.

- Are good class-room teachers.
- Pursues scholarly pursuits, they are self-regulated learners.
- Are men & women of higher human values.
- Derive strength from their personal style and quality rather than their official positions.
- Are people of natural creative instinct.
- Enjoy involved visioning.
- Rarely strategic, they are natural & genuine.
- Act like fathers who are highly task-concerned.
- Inspire staff.
- They are resilient without sacrificing the core values.

These qualities are by no means inborn. They are trainable, provided the teachers can dream & dream, which our president emphasizes so much and endeavour to attain the objectives. India has a unique ancient & modern store of knowledge for fostering leadership, which no other country possesses. So the slogan "Look East", rather than imitate the fragile glamour of the west, is not vacuous.

Controlling :

Educational institutions are dynamic organisations moving toward defined goals. So there must be controls which can keep them on track. Controls are not supervision. They are essentially information flow or feedback to the persons who belong to the institutions. Any system natural or artificial has controls. Human body has in-built controls and every living body does have so. All automatic artifacts have controls. In fact, cybernetics is the science of controls so there is no doubt that managing of institutions will also have controls. But we should not equate them with administrative supervision. For all who belong to educational institutions, there are **entry level controls** and **process level controls**. Let us take them one by one :

a) Entry level controls for teachers : competencies of teachers at different levels of education are assessed by a) academic achievement, b) competitive tests & c) interviews. These are constantly revised and new norms established for entry into the profession. Personality factors like commitment etc. are the main assessing items.

   For students : school education is open for all children in state controlled schools. But private schools have their own criteria for entry of students because their objectives are some what tangential to educational objectives. Employees have tests & interviews at institutional levels.

b) Process level controls : These controls are more important. These controls are often confused with administrative supervision. But **supervisions come from above** but **controls come from within the system**. If the system malfunctions red lights are immediately on and those who run the system take necessary actions. For teachers, different types of feedback have been devised, but not extensively used. A little enterprise on the part of the teachers can ensure their availability and use. Feedback thus generated is the mirror upon which teachers can see the lacunae in their performance and correct them easily. Teachers also need to sit together and brain storm each other over cups of tea, much like what corporate managers do. Why should we throw overboard the tradition of argumentative Indian ?

For students, there already exists a lot of process controls in terms of semester system, tests at specified intervals, questioning in class-room. These can be increased in number and students can also use these feedback as mirrors to understand their achievement. The non-teaching personnel can also devise their own method of collecting feedback and make a place in the collective leadership. All the above mentioned factors will work properly if the individuals belonging the institution feel belongingness for it and strive for its excellence. The short-sighted go for privatisation, but privatisation in this country of 110 crores, cannot deliver education to all.

The writer in the preceding discussion, has tried to give a bare outline of educational management techniques, which need to be developed and perfected. In conclusion, it can be reiterated that knowledge is the sine-qua-non of education. It is with the help of knowledge

that educational objectives are attained. There are two aspects of knowledge. (a) It is growing at a break-neck speed. Even a Vedavyas can not grasp all of it. So acquiring knowledge should be selective. (b) It is wealth–man's greatest spiritual creation. As of all wealth there are owners of the wealth. Those who own this wealth have overwhelming advantage to increase it as they need. And they are doing this. It has been amply proved that highly educated elite whatever be their absolute number, cannot indicate & sustain welfare of the nation. It is the whole people that have to be educated. It is upto the teachers to take up this challenge and shift the ownership of knowledge from a few to the masses. This has to be taken as a mission.

GOING TO DUAL MODE : A SMALL LEAP BUT A BIG CHALLENGE.

Paresh Chandra Biswas *

Indian Pleadge, Platform and Perspective for Negotiation of the Challenges

Flow of cross-boarder student traffic is increasing worldwide. In 1990 there were 1.2 million international students and the number rose to 1.5 million in 1995. The number was 1.8 million in 2000 and it rose to 2.1 (estimated) in 2004. The countries of choice were USA, UK, Australia, Germany, France, Netherlands. In case of India student mobility from and to India in 2001, may be depicted as :

Table : 1 Student Mobility from and to, India in 2000-01

Country				Country
USA	47,411	←		240 USA
UK	4302	←		51 UK
Australia	4578	←		44 Australia
Germany	1412	←	INDIA	19 Germany
France	239	←		23 France
Europe	7468	←		180 Europe
WORLD	61812	←		6896 WORLD

The contents of the above Table depict a glaring imbalance in cross-border traffic of students. India is constantly loosing the profit in comodification of higher education and there will be increasing net loss in trade in HE.

We are here : Tenth plan

The importance of education in general and especially in HE has been constantly growing and knowledge-based industries are now occupying the centre stage in development. Over the past 50 years there have been a significant growth in the number of new universities and institutions of higher learning in specialized areas. There are about 273 universities and deemed to be universities (including 18 medical universities and 40 argicultural universities) and 12300 colleges, of which 4683 are in rural areas (Table : 2).

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Table : 2 Number of Universities, Students and Teachers

Year	No. of Colleges	No. of Universities*	Students (in 000)	Teachers (in 000)
1950-51	750	30	2,63.000	24,000
1990-91	7,346	177	49,25,000	2,72,000
1996-97	9,703	214	67,55,00	3,21,000
1998-99	11,089	238	74,17,000	3,42,000

* includes institutions that are deemed to be universities, but excludes other institutions
The Ninth Plan reiterated the objectives/policy directions of the NEP, 1986 and its POA, 1992. It emphasized on the following strategies—

Consolidation and expansion of institutions; Development of autonomous colleges and departments; Redesigning the courses; Training of teachers; Strengthening of research; Improvements in efficiency; review of monitoring.

Moreover during that plan period we saw the emergence of separate universities for science, and technology, health sciences, judicial science, autonomous colleges with freedom to design curricula, evolve new methods of teaching and research frame admission rules and conduct examinations as well as Centres of Excellence and NAAC. Promotion of value education and strengthening management systems. Rs. 2,270.92 crore [an outlay of Rs. 2,520.06] was incurred.

It is now increasingly recognized that in the context of major economic and technological changes, the system of HE should equip students with adequate skills to enable their full participation in the emergence social, economic and cultural environment. Universities are thus needs to restructure to cater divergent needs of the students and adults. ICT is to the strong arms of education delivery systems.

The Tenth Plan envisages raising the enrolment in HE of the 18-23 year age group from the present 6 per cent to 10 per cent by the end of this plan.

In developing countries about 50% enrolment on the average of 18-23 year age group has been reported. Higher enrolment in HE is equally justified in view of the global trends in HE. For this the strategies would focus on increasing access, quality, and adoption of state specific strategies and liberalization of HE system. Emphasis should also be laid on the relevance of curriculum, vocationalization and net working on the use of ICT platform. The Plan would focus on distance education; convergence of formal and non-formal, distance and IT educaiton institutions, increased private participation in the management of colleges and deemed to be universities, etc.

Further during information explosion, the adults including professionals require, de-skilled, re-skilled and hence continuous life long learning. as half-life of vital knowledge is very very short. The alternatives ? **Dual Mode University.** Existing single mode state universities are encouraged to add ODL system to their activities.

Strength of ODL can be assessed if we look at present status of IGNOU in HE.IGNOU with 46 Regional Centres, 691 study Centres are offering 72 Courses to 1.3 million students.

IGNOU along with 104 other universities with directorate of distance learning are offering 13% of the total students enrolled in HE in India.

The alternate solution is expanding the system of ODL. The viable mode is opening extra ODL mode in the existing single mode universities. This is going to a dual mode that is very popular in Australia and other countries.

What Facilities We Have ? EDUSAT

EDUSAT: India's response to Challenge in Educating the Nation

EDUSAT implies India's pride, especially in the area of education. It is the real springboard for high tech jump to reach the out-reach learners.

EDUSAT is a Dedicated Satellite for Education to be operative shortly through National and State Level ICT Network for Literacy, Elementary Education, Vocational Education and Teacher Training. As a pride product of a collaborative project of Indian Space Research Organization (ISRO), Ministry of Human Resource Development (MHRD) & State Departments of Education (SDE), it is a state of the art technology mediated complex systems to materialize education revolution in India and to attain the cherished goal of "Educating the Nation". Particularly, Development and Educational Communication Unit (DECU) of ISRO, Ahmedabad and the National Institute of Educational Planning and Administration, (NIEPA), New Delhi, are two key pins behind this gigantic project to deliver appropriate education and learning to all citizens.

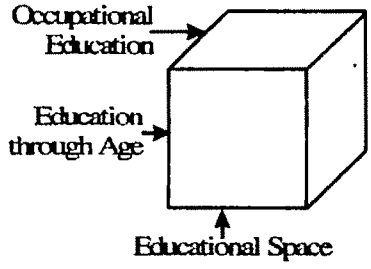
Challenge in Education in India is conceived to exist in three-dimensions, though not orthogonal in structural pattern. These are enumerated as "education for all ages, education of the in-school and out-of school population and education in various occupations". Moreover, the "challenge is two-fold–that of numbers and of quality". By education we mean holistic education covering totality of life-physical, mental, intellectual and spiritual from womb to tomb.

The project envisages that a right response to the challenge is that a full–dedicated satellite is the best solution to harness the power of satellite based ICT enabled education all thorough the educational space in India. Considering the divergent educational needs at all levels in 16 different regional languages and adoption of variety of interactive techniques, the dedicated satellite, now coined, EDUSAT, preferably have 72 channels with ample options for further expansion. The space segment must be well supported by a server and a studio at state level. Receive Only Terminal (ROT) at all primary and upper primary schools and Interactive Terminals at all DIETs, BRCs, secondary and senior secondary schools, all colleges and universities and at all Gram Panchayets for non-formal education to build a network of information super highway.

The most serious concern is who to bell the cat to feed all those channels with appropriate state of the art educational software pertaining to multifarious types of education to be delivered for the divergent target groups. Are there enough professionals to feed and work with the envisaged 72 channels where a full time channel warrants at the rate of 3 programmes per hour, 72 programmes per day or 26,280 programmes per year ? The honest reply is, No. How to negotiate the challenge ? Therefore, it is a clarion call to update and upscale the in-house programme production capacity and develop a network of specialist production

agencies for outsourcing. To ensure effective utilization of the dedicated satellite for educating the nation, the teachers must wake up from cozy slumber and be prepared to undergo changes.

This is not utopia. It is a necessary utopia because our greater challenge today is—Creating a Knowledge Society—to keep pace with the information explosion, to remain updated and keep the nation updated. The lesson is: "it is not to be best; it is important to be there". For this to continue **the challenge is to "de-skill, re-skill and re-educate the workforce on a continuing basis"**. In practical terms the challenge is the challenge in Human Development and its structure is three–dimensional constituting challenges in *Educational Spaces, Education through Age* and *Occupational Education.* Each of the three dimensions speaks volumes of difficulties, concerns and problems, those need not explain fully here. The message is multi-level measures and techniques warrant negotiating the entire challenge what we Indian are facing now.



Three-Dimensional Challenges in Human Resource Development

Responses to this challenge are not necessarily found in the library selves. There has to be "paradigm shift in conceptualization in human learning and to adopt to the whole range of new generation pedagogy and andragogy to educate millions with quality". It will be needed to resort to multiplicity of modes of delivery systems. Satellite based ICT enabled education may be an effective response to this challenge of quality and it will enable ICT enabled educational multi-delivery modes of:

- **One-way TV telecast;**
- **Interactive TV via phone in,**
- **Interactive TV with computer support through e-mail;**
- **Video conferencing;**
- **Computer conferenceing;**
- **Telephone conferencing, and**
- **Web-based instruction, etc.**

Adoption of all the above types of methodologies is only possible with right kind of satellite. To leave room for all types of education fully dedicated channels are needed for–

1. School education
2. Higher and professional education
3. Education in science and technology for all ages

4. Language education
5. Education in sports, games, dramatics, leadership, transition to work for youth
6. Continuing education of the workforce in all occupations and levels
7. Women's education and empowerment
8. Eduation for age
9. Children's education and entertainment, and
10. Education in health etc.

Proposed Channels for the 1st phase journey of EDUSAT is charted as shown below:

Channel Contents	No. of Channels
State channels (both broadcast and interactive on time sharing) one for School Education and one for Higher & Professional Educaiton	28+28
National channels for Science, Math and CBSE	02
Sports, Music, Dramatics, Painting	02
Executive and Occupational Education	02
Health	02
Children	02
Senior Citizen	02
Women Development	02
Language Learning	01
Indian Culture and Heritage	01

Ground facilities are now existing in India though these are neither well-covered nor under good resources of various departments within the government like ministries of HRD, Agriculture, Rural Development, Urban Development, Information Technology, Science & Technology, Environment, Electronics, etc should be pooled together. Organizations like NCERT, NIEPA; NOS, IGNOU, UGC, NCTE, NAB, AICTE, etc. would work together. Finally, millions of classroom teachers are to be updated and re-educated to join their hands, heads and hearts in EDUSAT project dedicated to **EDUCATING THE NATION.**

[Acknowledgement to Shri B. S. Bhatia, DECU, ISRO & Prof. M. Mukhopadyay, NIEPA for borrowing ideas and materials respectively from 'EDUSAT-A Dedicated Satellite for Education' and 'Educating the Nation']

The Centrality of the Challenge:

The Task is managing the paradigm shift-structural, functional and philosophical transformations that can be viable through understanding of

1. Science of Education—ISD, PEDAGOGY, ANDRAGOGY
2. Definition of Target Groups
3. Content Development

4. Educational Software
5. Hardware—space segment & Ground segment
6. Management—

The following discussion will embrace mainly the Item 3 and touch on Item 1 for understanding the later.

A paradigm shift in the *role of the teacher* as well as the *use of technology in the classroom* is required in order to implement constructivist strategies that assume.

- Knowledge is constructed from experience
- Learning is a personal interpretation of the world
- Learning is an active process in which meaning is developed on the basis of experience
- Conceptual growth comes from the negotiation of meaning, the sharing of multiple perspectives and changing of our internal representations through collaborative learning.
- Learning should be situated in realistic settings; testing should be integrated with the task and not a separate activity.

(Merrill, 1991 in Smorgansbord, 1997).

Paradigm shift in concept of teaching-learning may be looked as:

Station-OLD ⟶	**Station-NEW**
Learner is passive	Learner is free and active
Learner is expected to learn correct response	Learner is to create mental model to solve problems in ambiguous situations
Teacher transmit knowledge	Teacher and learner act in collaboration
Knowledge is a matter of remembering information, mostly unthinkingly	Knowledge is personal and comes after negotiation with the problem at hand of the learner
Learning is facilitated by practice	Learning is facilitated by negotiation
Application requires transfer of training requiring common elements	Application require negotiation strategies
Teacher directs student learning	Student mainly directs his own construction of reality and learns independently
Learning is set in artificial environment	Learning situated in realistic (/virtual) settings; integrated with the task not a separate activity
Behaviourism	Constructivism

Suggestions-Capacity Building

The capacity building programme along this new direction embraces huge activities of divergent type and nature. Some of them are not within the realm of the teachers. But teachers

are to set their professional updatement in material development as well as in counseling the distant learners.

Hilary Perraton and Charlotte Creed (1999) suggest that special attention needs to be concentrated on the following three areas and particularly, but not exclusively, within dual-mode contexts:

1. *enhancing the institutional support available to ODL course development teams*
2. *raising the standard and status of ODL*
   - *the professionalisation of ODL training and course development*
   - *strengthening the editor chain behind course production*
   - *time-efficient strategies in training and course development*
   - *reward structure*
3. *adopting middle-term developmental aims*

Secondly, there is a clear need for a broader range of staff development options in all three identified options. In developing-country, dual-mode institutions, training needs to be cost-and time-efficient but not at the expense of quality.

What is the content of training?

In the induction stage and within the accompanying literature, training for authors typically covers four main areas:

1. An orientation to ODL—examples include a history of ODL, ODL systems (tutorial, editorial chain), differences of ODL to teaching and textbooks.
2. Pedagogy—examples include underlying theoretical/pedagogical principles, promoting active learning, learner-centred materials, thinking about your learners
3. Materials development—examples include course development processes, course planning, the selecting and integrating of media.
4. Good writing practice—examples include planning units, clear writing, interactive writing integrating readings and tutor-marked assignments (TMA's), print presentation (typography, format) non-discriminatory writing

Example of an ODL Material

PROGRAMME-B.Ed

COURSE ES-331: CURRICULUM & INSTRUCTION

BLOCK-1: CURRICULUM PLANNING

UNITS-17

SPECIFIC EXAMPLE-UNIT-1 [BLOCK 1]

STRUCTURE —

1.1 Introduction

1.2 Objectives

1.3 Curriculum: The Concept

1.4 Bases of Curriculum

1.5 The Curriculum Process and Its Stages

1.5.1 Selection of Aims, Goals and Objectives

1.5.2 Selection of Learning Experiences

1.5.3 Selection of Content

1.5.4 Organization and Integration of Learning Experiences and Content

1.5.5 Evaluation

1.6 Major Approaches to Curriculum

1.6.1 Process Approach

1.6.2 Structure Approach

1.6.3 Humanistic Approach

1.7 Role of Curriculum in Effective Teaching and Learning

1.8 Let Us Sum Up

1.9 Unit-End Exercises [Summative Evaluation]

1.10 Answer to Check Your Progress [Formative evaluation]

1.11 Suggested Reading

Some special Features of ODL materials

- Clearly stated objectives in behavioural terms,
- Advise about how to use the study materials.
- "You" and "I" style of writing-user friendly
- Short meaningful chunk of learning,
- Fewer words than usual per page (screen),
- Plenty of helpful examples,
- References to the learners' experiences,
- Illustrations used where they are better than words,
- Headings and sub-headings to help learners,
- Links to other media where appropriate,
- Careful to learners' differential needs,
- Exercise that get the learners to use the materials,
- Space for learners to write down their ideas,
- Feedback to help learners check their own progress,
- Suggestions about getting help from other people,
- — [may *be added more points*]

Organization of the Materials :

1.1 Introduction : simple, interesting, precise, brief, examples from life situations

1.2 Objectives : spelled out in behavioural terms. AFTER GOING THROUGH THIS, UNIT, YOU WILL BE ABLE TO:

- Define and explain the concept of curriculum;
- Cite various interpretations of curriculum;
- Explain the curriculum process and its various stages;
- Describe various approaches to curriculum and differentiate between process, structure and humanistic approaches;
- Illustrate and explain the role of curriculum in effective teaching and learning

1.3 CURRICULUM : THE CONCEPT

Content + Learning Experiences

CHECK YOUR PROGRESS

1.4 BASES OF CURRICULUM

References :

Distance education practice: training and rewarding authors

Hilary Perraton Hilary & Charlotte Creed (1999). **Distance education practice: training and rewarding authors;** Report to the Department for International Development: By the International Research Foundation for Open Learning

Rowntree Derek (1994). Preparing Materials for Open, Distance and Flexible Learning.

Kogan Page (2005) Making open and distance learning work.

PROFESSIONAL ETHICS FOR THE TEACHING COMMUNITY

Arjun Das Gupta *

Introduction

I am really grateful to the organisers for giving me this opportunity to say a few words and share my views with you on a lively topic–'Professional Ethics for the Teaching Commonity'. As a teacher I cannot check my temptation in choosing 'teaching profession' and its ethical aspects for today's discussion. The concept of "Professional Ethics" signifies the system or code of morals of a particular profession. The term 'morals' (in its plural form) is related to the principles and practices in regard to what is right and what is wrong in performing professional duties, and responsibilities. In order to recognize what is professionally right and wrong, it is always needed to develop a genuine conception of 'Profession'.

Profession :

There is no profession without something to profess. Members of a profession must be more than well paid, well thought of, licensed, learned and organised. 'Profession' what we mean here is perhaps something more than a vocation. Members of any profession must claim and openly declare i.e. profess—a higher standard of conduct than any other ordinary people. They must assume some special responsibilities.

As teaching is a learned profession we must confine ourselves to 'Learned profession' while discussing the Ethical aspects. There were only three learned professions at the beginning. They were associated with their respective foundation disciplines, namely 'Theology' 'Law' and 'Medicine'. Now we have various types learned professions in our society.

Ethics :

There cannot be perhaps any profession without its own ethics. Ethics is the science of morals. It is concerned with the character and conduct. According to a scholar it is "science of judging specifically human ends and the relationship of means to those ends. It is an art of controlling means so that they will serve specifically human ends".

'Ethics is a man made mechanism that must be used consciously and continuously to maintain direction, stability and equilibrium".

A scholar once began a discussion on ethics with a discussion of wrong-doing. Does it suggest that wrong-doing is common while ethical conduct is rare? Media, legislature and

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courts focus on wrong-doing. The answer for newspapers is proverbial : Dog bites man is not a news, since it happens almost every day, man bites dog is a news—it hardly ever happens. If wrong doing were common, the legislatures would investigate the few cases in which things went right, hoping to find out why, and courts, overwhelmed by crime, would have to reward who did what they should. Morality binds all rational agents. The ethics of a group is binding on members of that group only insofar as they do something. Christian ethics binds only those who become Christian; business ethics binds those who engage in business and teaching ethics binds teachers only. What is true of ethics in general is true of professional ethics in particular. Claiming to be a member of a certain profession is claiming the respect, trust, and pay accorded persons believed to adhere to the standards of practice to which that profession is publicly committed. Those who claim membership in a profession and yet do not adhere to its standards are taking unfair advantage of those who do adhere. Unprofessional conduct is, in short, a violation of the moral principle.

Ethic—Centres :

Innumerable Ethics-Centres have proliferated over the past three decades in different parts of the world, particularly in USA. **Kennedy Institute of Ethics** (1971) at Georgetown University, is a teaching and research Centre offering ethical perspectives on major policy issues. **University Centre for human values, Princeton University** supports teaching and discussion on ethics. **Asian Bioethics Program** (1985) under the direction of Prof. Rihito Kimura is a Resource & Reference Centre at Tokyo on the issues relating to ethics & values. It is focussing on cross - cultural aspects (US-Japan) of Biomedical ethics & business ethics. **The Association for Practical and Professional Ethics (APPE)** was founded in 1991 with support from Indiana University and the Lilly Endowment to encourage inter-disciplinary Scholarship and teaching of high quality in practical and professional ethics by educators and practitioners who appreciate the practical and theoretical aspects of their subjects. The Association welcomes thoughtful practitioners as well as scholars and educators, college and University faculty from any discipline who have a scholarly interest in ethics or who have concern for moral education. The Association is also bringing out some news-letters like **Ethically speaking, Profiles in Ethics** etc.

There are more than 150 Dartmouth faculty members and administrators, who belong to **Ethics Institute,** at Hanover, Germany taking keen interest in applied and professional ethics ranging from medical, business, legal and engineering to the ethics of teaching and research. They gather in Seminar Groups, at forums and task force meetings to discuss ethical issues, to prepare publications, organise symposia and conferences and also develop courses.

In June 1996, the **Illinois Institute of Technology Centre for the Study of Ethics in the Profession (CSEP)** had received a grant from National Science Foundation to put their collection of over 850 codes of Ethics on a worldwide web. They have also under taken the **Online Ethics Codes Project (OECP)** in order to enhance access to a wide variety of codes. The codes of Ethics online site is continually updated. In 1995 some scholars suggested a few possible functions of **Code of Ethics.**

Teaching Profession :

Teaching in any branch of knowledge is definitely an art. The essence of the art is to produce quality in teaching. Teaching is a mission. A teacher must have quality of dedication to

acquiring knowledge and its proper dissemination. A Scholar has aptly opined that "a teacher is someone who comes into the young lives as light to enlighten their paths. Someone who accepts the students as they are with all their strengths and weaknesses thereby preparing them to face the challenges of life through patient toil and intelligent instructions".

A teacher has not only to instruct their students but also to inspire them. How a teacher can inspire his or her students ? He or she has to know the life and character of his or her students and equip them with high ideas and lofty values which will make them easier to enter into the stream of national life as worthy citizens' Swami Vivekananda ones opined that a teacher must be sinless, he must be true. He should not have any ulterior motive, for name or fame, but simply wins his/her students through love. Teachers in schools, colleges and Universities have some specific responsibilities.

Teaching is not merely a technical business but it is moral craft. There are things that teachers value and want to achieve through their teaching. On the other hand there are things that they do not value, which they feel may do harm to the students, they are guiding. Teachers are the best judge in developing the career of their students. A teacher, it is said, has three kinds of commitments;

i) **Vocational** i.e. which deals with missionary character of teaching.

ii) **Professional** i.e. being knowledgeable, compact and instructionally effective.

iii) **Career continuance** i.e. commitment to remain in teaching for the security and extrinsic rewards it brings.

A modern teacher is no longer limited to the narrow spheres of his class rooms. A teacher in the true sense is actually an academic leader of the society. As a leader he/she should have some inherent qualities. He/She should also take up the responsibility for improving the standards of his/her students.

In 1966 our Education Commission observed that "of all the different factors which influence the quality of education and its contribution to national development, the **quality, competence** and **character** of teachers are undoubtedly the most significant." **Sen Committee,** in 1973 made the following observation on professional standards for teachers:

"Every profession is expected to **maintain certain standards** and society has right to demand those standards from the teaching community. A teacher's **research** publication, his writings and their impact on society, his skills and his behaviour patterns with his students etc. are some of the many professional standards set for the members of the teaching profession...."

Our University Grants Commission has also considered the matter and agreed that norms of professional ethics should be evolved. The Commission, prepared a code of professional ethics of University and College teachers.

A manual entitled **Manual of Service Conditions of Teachers in Universities and Colleges in India** (New Delhi, Crest Pub. House, 2001), has mentioned about the "Report of the Task Force Code of Professional Ethics for University and College Teachers". In this Report it has specifically enumerated the 'Code of Professional Ethics' with the following subheadings:

i) Teachers and their Responsibilities;

ii) Teachers and the Students;

iii) Teachers and Colleagues;

iv) Teachers and Authorities;

v) Teachers and Non-teaching Staff;

vi) Teachers and Guardians;

vii) Teachers and Society;

Teachers' Associations :

In various countries of the world teachers' organisations have prescribed and some are still prescribing a specific code of ethics for their members. This helps them to preserve the professional character of their organisations and partly to strengthen their internal unity and solidarity. In India some associations have also discussed this matter from time to time but as we find, there is hardly any specific movement in this direction. Some of the school level organisations which have adopted the codes of professional ethics, we understand, have not progressed much in enforcing these codes.

A particular working group of the National Seminar on Teachers held in Delhi in Sept. 1983, took the stock of the existing situation and came up with some suggestions, in connection with the roles for the Teachers' Organisations.

The Teachers' Organisations were mainly involved with the improvement of the salary and service conditions of teachers so far. And this they have without question, achieved considerable success.

Observations:

Excellence in the field of academics is the need of the hour. The teacher and faculty members of various educational institutions are capable of contributing in different fields by undertaking various useful projects and research activities. A teacher should always move for improving the educational standards of each and every students. He or she has to clearly spell out communication policies, expectations and responsibilities for students. He must encourage students to improve their attainments, and develop their personalities. He must be affectionate to the students and not behave in a vindictive manner towards any of them for any reason whatsoever.

Codes of Ethics are still controversial documents. How far these will be practicable in Indian situation is a matter still to ponder. As we have seen inspite of UGC's effort and some moves made by the Teachers' Organisations in India, most of the academic institutions could not implement these as yet. Some have even suggested that such codes are unnecessary and pointless Some believe that these are useful and important, but disagree about why. According to a scholar it is mistaken to assume that there is a special ethics for professionals, which is separate from the ethics of ordinary human beings within a moral society' (John Ladd).

Various teachers organisations of our country must come forward and arrange some discussions, seminars etc., if not full-fledged course, on professional ethics.

Each and every teacher is expected to discharge his/her professional responsibilities according to the existing rules and procedures.

The members of the teaching community are not expected to accept any other employment

and commitment including private tutions and coaching classes, which are likely to interfare with their professional responsibilities.

A teacher must feel for the well being of the people in and around him. He must work in to improve the quality of education in a partioular area and strengthen the moral and intellectual life of the community.

A teacher has to play an important role in a society. He or she has to be invested with dynamism and spirit of dedication. A teacher has to shoulder the national responsibility of educating our students. By doing these a teacher uplifts himself or herself to the high status of a national builder.

A present day teacher must have the qualities of sincerity, integrity, regularity and above all love for the profession.

FUTURISTIC EDUCATION

Nimai Roy *

One billion people are speeding towards super-industrialism. A mass future shock is apprehended. A 'soft landing' is necessary. A faint outline of the new society is emerging from the mists of tomorrow. Yet even as we speed closer, evidence mounts that one of our most critical subsystems—education—is dangerously malfunctioning.

What passes for education today, even in our best schools & colleges, is a hopeless anachronism. Everybody is insisting that now, as never before, one's future is almost wholly dependent upon education. Our schools are facing backward towards a dying system, rather than forward to the emerging new society. They are engaging their vast energy to create Industrial Men-people tooled for survival in a system that will be dead before they are.

To help avert future shock we must create **a super industrial education system.** To do this, we must research for our objectives and methods in the future, rather than the past.

Every society has its own characteristic attitude toward past, present and future. In stagnant society the past crept forward into the present and repeated itself in future. The Bible admonished "With the ancient is wisdom".

Mechanical age smashed all these because industrialism required a new kind of men having different values, different sense of time and new type skills. Mass education is the cleverly machine constructed by industrialism to produce the kind of adults it needed. The problem was complex. The solution was an educational system which simulated the new world. The whole idea of assembling masses of students (materials) to be processed by teachers (workers) in a centrally located school (factory) was a stroke of industrial genius.

The critisized features of education today are :

1) Regimentation
2) Lack of individualization
3) Rigid system of seating, grouping, grading and marking
4) The authoritarian role of the teacher.

The system, of course, is very effective instrument of adaptation for its place and time. Children lived a life in school modelled after the one they would live in future. Men had to devote increasing energy to understand the present. The focus of education began to shift away from the past and forward to the present. Dewey and his followers introduced "progressive" measures to focus on present rather than past. Educationists like Jaques Maritain and neo-Aristotelians like Robert Hutchins criticised the progressives as supporters of "presentism".

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Our education systems have not yet fully adapted themselves to the industrial age when the need for a new revolution - the Super-industrial revolution burst upon them.

Just as the progressives of yesterday were accused of 'presentism' it is likely that education reformers of tomorrow will be accused of futurism. We shall find that a truly superindustrial education is only possible if we once more shift our time-bias forward.

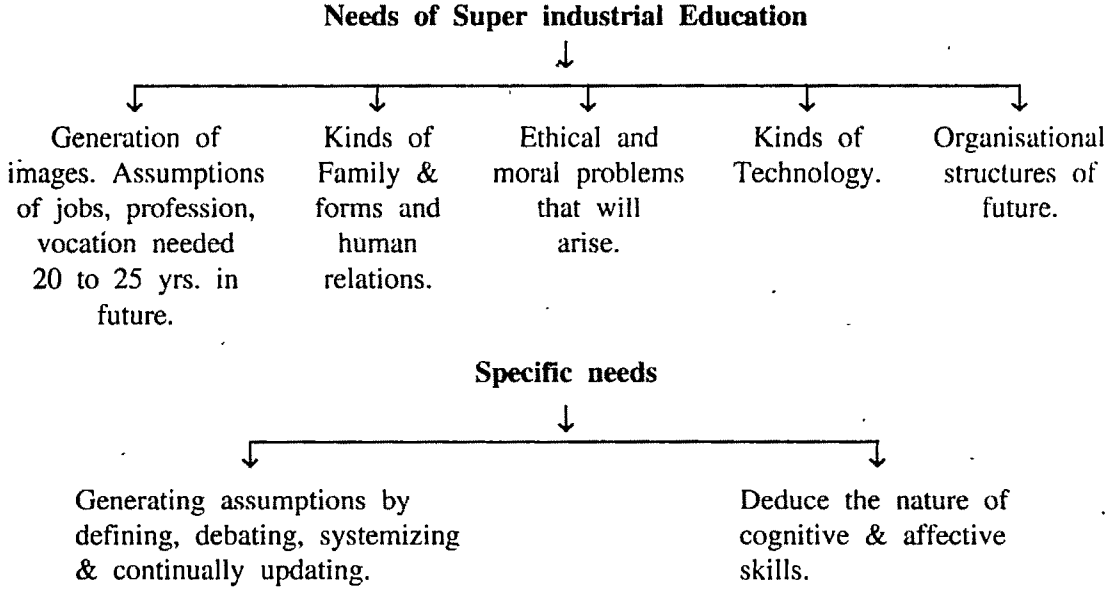
New Educational Revolution

In the technological systems of tomorrow (1) fast, fluid and self regulating machines will deal with the flow of physical materials, (2) men with the flow of information and insight. Machines will do - routing work. Men will do intellectual and creative tasks. Machine and men both, instead of being concentrated in gigantic factories and factory cities will be scattered accross the globe linked together by amagingly sensitive, near instantaneous communication. Human work will move out of the factory and mass office into the comunity and the home.

Machines will be synchronized to the billionth of a second. Men will be desynchronized. Factory whistle will vanish. Even the clock will lose its power over human. Organisation to control technology will shift from bureaucracy to Ad-hocracy, from permanence to transience, from concern with the present to a focus on the future.

In such a world men (1) who can make a critical judgement, (2) who can weave their way through novel environments, (3) who can quickly spot new relationships in the rapidly changing reality will be necessary.

In C. P. Show's words men who have "futures in their bones". The prime objective must be to increase the individuals "Cope-ability" –the speed and economy with which he can adapt to continual change. Understanding past and present are not sufficient. The learners and their teachers must learn to make repeated probabilistic, increasingly long range assumptions about the future.



Existing institutions for such work :

1. "Education Policy Research Centres"—
   (a) Syracuse University
   (b) Stanford Research Institute - charged with scanning the horizon with these purposes in mind.
2. Organisation for Economic Cooperation and Development—Paris.—created a division with similar responsibilities.
3. A handful of people in the student movement have began to turn attention to future.

Needs in Education

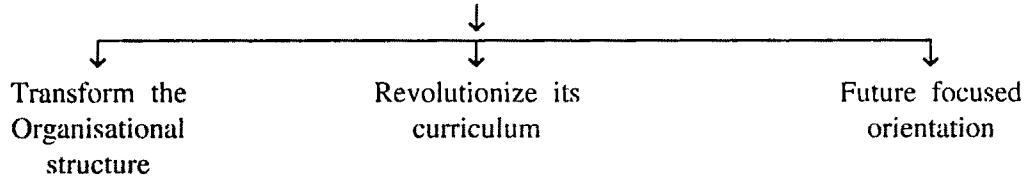
1. Future-responsive mass movement.
2. "Council of the Future" in every school and community—teams of men and women devoted to probing the future in the interests of the present.

"Prognostic Cells"—Advocated by Robert Junk of the Technische Hochschule in Berlin.

Since no group holds monopoly of insight into tomorrow, these councils must be democratic. Along with professional educators, planners and elite, the students must be included from the very start because they will invent and inhabit the future. The creation of future oriented, future-shaping task forces in education could revolutionize the revolution of the young. The council movement could provide purpose rather than hostility toward youth. By attracting community and parental participation - businessmen, trade unionists, scientists and others—the movement could build broad political support for the super-industrial revolution in education.

The Council movement could supply both - the direction in super-industrialism and the starting point : the future.

Objectives of the movement of futuristic education



1. Transform the organisational structure:

1. Home instruction instead of school
2. Computer-assisted education
3. Sophisticated teaching aids
4. Course modules and "short terms learning contracts" in nearby schools
5. School participation for social and athletic activities
6. Attendance laws will be pressumed to change
7. "Mobile education" to participate in significant community activity (Frederick J. McDonald of Stanford)
8. Bringing community to school Harold Howe, II, U.S. Commissioner of Education. Free space in school in return to free lesson by adults

9. Introduction of 'Mentors' as outside faculty - new kind of apprenticship
10. Lifelong education on 'plug in' plug out basis
11. Part time schooling and part time work
12. Experiental Programming Method will replace lecture method
13. Adhocratic administration

Curriculum :

Nothing should be included in a required curriculum unless it can be strongly justified in terms of the future - that means scrapping a substantial part of the formal curriculum. Tens of millions of pupils today are forced by law to spend precious hours of their lives grinding away at material whose future utility is highly quesitonable. Nobody even claims it has much present utility.

Should they spend as much time as they do learning foreign and vernacular languages ? Should all children required to study Algebra ? They might benefit from the study of probability, Logic, Computer Programming, Philosophy Aesthetics, Mass Communication.

Why teaching be organised around such fixed disciplines as	Why not around
English, Economics, Mathematics or Biology	Stages of the human life cycle : a course on birth, childhood, adolescence, marriage, career, retirement, death, contemporary social problems, significant technology, of the past and future, or around countless other imaginable alternatives.

Curriculum of today

↓

Standardisation of elementary and secondary schools No choice of study. Variation from school to school very little. Framed to meet the entrance requirements of the colleges.

↓

Vocational and Social requirements of a vanishing society.

Revolution in Curriculum

1. Curriculum updating requires a systematic approach of the whole problem - not piecemeal revision.
2. Not a single all-purpose, permanent new curriculum - instead sets of temporary curricula along with procedure for evaluation and renovation as time goes by.
3. A fight must be waged to alter the balance between standardisation and variety in curriculum. Though diversity will create problems dangers of social fragmentation cannot be met by maintaining a highly homogeneous education system while the rest of the society races towards heterogeneity.

4. The conflict between the need for variety and the need for common reference points is to distinguish in education between 'data', as it were, and 'skills'.

A diversity of data

We shall never be able to forecast the exact sequence of future states of the society. Just as genetic diversity favours the survival of species, educational diversity increases the odds for survival of the society.

Instead of a standardised elementary and secondary school curriculum in which all students are essentially exposed to the same data-base, the same history, maths, biology, literature, grammer, foreign languages etc. —futuristic movement in education must attempt to create widely diversified data offerings. Far greater choice than at present; they should be encouraged to taste a wide variety of short term courses (2 or 3 weeks duration) before making longterm commitments. Schools should offer scores of optional subjects, all based on identifiable assumptions about future needs. Range of subject should be broad enough so that apart from dealing with "known" (highly probable) elements of the highly-industrial future, some provision should made for dealing with the unknown, the unexpected, the possible.

Contingence Curricula of subjects	
Non existing now	Never materialize
Life in submarine community, Underwater housing. Children outer space life, space technology, experimenting with communal or other family forms of the future - under responsible supervision and constructively channeled.	Calamities, Contamination of earth from the planets or stars, Communication with extra terrestrial life, Monstrocities produced by genetic experimentation.

The principle of diversity will dictate fewer required courses, increasing choice among isolated specialities. By creating contigency curricula, the society can bank a wide range of skills, including some it may never have to use, the result is variety in man and his ideas.

System of Skills :

All students should be grounded in certain common skills needed for human communication and social integration.

People of Superindustrial Society will need new skills in the areas of Learning, Relating and Choosing.

Learning Skills :

1. Learn how to learn
2. The new education must teach the individual how to classify and reclassify information, evaluate, change categories, move from abstract to concrete and vice-versa (Psychologist Herbert Gerjuoy of Human Resources Research Organisation). Tomorrows illiterate will not be the man who can't read; he will be the man who has not learned how to learn.

Relating Skills :

Education must teach us to relate

Choosing Skills :

Superindustrialism will multiply the kinds and complexities of decisions facing the individual. —Education must address the issue of overchoice directly.

Superindustrial educators must not attempt to impose a rigid set of values on the students; but they must systematically organize formal and informal activities that help the student define, explicate and test his values, whatever they are. Young people must be taught the skills necessary to identity and clarify, if not reconcile, conflict in their own value systems.

Curriculum of tomorrow must include :

1. Not only an extremely wide range of data oriented courses but a
2. strong emphasis on future-relevant behavioral skill
3. It must combine a variety of factual content with universal training in what might be termed "life know-how".

Attention to future depends on :

1. Maturation - Stephen L. Klineberg of Princeton describes as "an increasing concern with distant future events" - normal teenagers maturation is accompanied by
2. The faster the environment changes, the more need for future
3. Future focused role image Framework for the present is created by the future (Sociologist Benjamin D. Singer of the University of Western Ontario, whose field is social psychiatry)
4. Enhancement of the sense of the future.

We have many built in spanners that link the present generation with the past. But no time spanners enhance our sense of future : No heritage of the future.

We teach courses on history, why not courses on "future" - courses on possibilities and probabilities of future - systematically explored. Robert Jungk (a leading European futurist philosopher) said, "Now-a-days almost exclusive stress is laid on learning what has happened and has been done. Tomorrow at least one third of all lectures and exercises ought to be concerned with scientific, technical, artistic and philosophical work in progress, anticipated crises and possible future answers to these challenges".

There should be literature of the future instead of only science fiction on future. Literature of the future can lead the mind of the young through an imaginative exploration of the jungle of political, social, psychological and ethical issues that will confront these children as adults.

Simply study will not do. Various games have been designed to educate young people and adults about future probabilities and possibilities.

Future autobiography writing by young children picturing themselves five, ten, or twenty years in future.

READING AND WRITING MOTIVATION OF CHILDREN IN PRIMARY EDUCATION

Debdulal Dutta Roy *

The term 'Motivation' refers to the internal processes that give behavior its energy and directions. It originates from a variety of sources (needs, cognitions and emotions) and these internal processes energize behavior in multiple ways such as starting, sustaining, intensifying, focusing, and stopping it (Reeve, 1996). Motivation is claimed to be the product of interdependence between and amongst many variables, such as locus of control (Duke and Nowicki, 1974), the need for affiliation, impulsiveness and planfulness (Friis and Knox, 1972), personal achievement, social achievement, academic achievement (Maehr, 1984; Piedmont, 1989), mastery, work orientation, competitiveness and personal concern (Donohue and Wong, 1997; Helmreich and Spence, 1978).

Motivation has been studied from different perspectives in different disciplines of psychology. To understand academic motivation of students especially in primary schools, reading and writing motivation are assumed to be important variabls for research. Reading and writing motivation are the processes to put more effort on reading and writing activities. This is framed with one's appraisal of relationship between reading or writing motives and the reading or writing outcomes. Waugh (2002) identified ten models of motivation in the literature, each emphasizing different aspects, some of which are interrelated. The ten models can be summarized under the headings, arousal and anxiety model (Neveh-Benjamin, 1991); needs model (Maslow, 1970), achievement and social goal model (Bandura, 1986; McClelland, 1985); behavioural motivation model involving rewards, reinforcement and intrinsic motivation (Cameron and Pierce, 1994; Heckhausen, 1991), attribution theory (Weiner, 1985), self-regulated learning model (Corno, 1992; Reeve, 1996; Zimmerman, 1990), perceived self-efficacy model that relates personal beliefs to actions to achieve (Bandura, 1982; Schunk, 1989), and personal investment model involving tasks, ego, social solidarity and extrinsic rewards (Maehr, 1984; Maehr and Braskamp, 1986). Of the above ten models, prior studies paid attention to self-efficacy and achievement and social goal models in conceptualizing variables for assessment of reading motivation. Based on Bandura's self-efficacy theory, Baker, Afflerbach and Reinking (1996); and others demonstrated some determinants of reading motivation—sense of self-efficacy and task values. Schunk and Zimmerman (1997) demonstrated that children's sense of efficacy (children's evaluation of their competence in reading) relates to their academic performance. If individuals believe that they are competent and efficacious in reading they may not engage in it if they have no task values. Eccles et. al. (1983) identified three task values, interest value (how much the individual likes the activity); attainment value (the importance of activity) and utility value (the usefulness of

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an activity). A construct related to the interest value compnent is intrinsic motivation. Intrinsic motivation refers to choosing to do and then doing an activity for its own sake, rather than for "extrinsic" reasons such as receiving recognition (Dici and Ryan, 1985). Based on above theories, Wigfield and Guthrie (1997) identified few variables for assesment of reading motivation. They are (i) reading curiosity (the desire to learn about a particular topic of interest to the child), (ii) reading challenge (the satisfaction of mastering or assimilating complex ideas in text); (iii) reading importance (subjective task values as reported by Eccles et. al. 1983; Wigfield and Eccles 1992, in their work), (iv) reading involvement (the enjoyment of experiencing different kinds of literary and informational text) (v) competition in reading (the desire to outperform others in reading), (vi) recognition for reading (the gratification in receiving a tangible form of recognition for success in reading) and (vii) reading for grades (the desire to be evaluated favorably by the teacher).

Like Reading motivation, following Bandura's model of self-efficacy, Pajares, and Valiante (2001) conceptualized five characteristics of writing motivation—writing self-efficacy, writing self-concept, self-efficacy for self-regulation, value of writing, and task goals. Since earlier study paid attention to the cognitive behaviourstic model of personality in conceptualizing writing motivation, it failed to unearth some of the important variables (motivaiton to read for application or motivation to write for emotional expression etc.).

Rescaschers have identified 7 characteristics of Reading motivation as Application, Achievement, Knowledge, Affiliation, Aesthetic, Recognition and Harm avoidance and 7 characteristics of writing motivation as Documentation, Emotional expression, Achievement, Creativity, Harm avoidance, Affiliation, and Recognition, Of the 7 characteristics, Application, Achievement, Knowledge are assumed to be the intrinsic motivation and rest of them are extrinsic motivation characterisitcs. Again in case of writing motivation, Documentation, Emotional expression, Achievement, Creativity are the intrinsic motivation and others are the characteristics of extrinsic writing motivation. It is noted that children with high intrinsic motives performed better in examination than the students with extrinsic motives.

School plays critical role in developing motivation to read and write among the children. As motivation is shaped by various reinforcements in these social institution, aim of this study was to examine pattern of reading and writing motivation of children in Govt. aided, Missionary and Corporation Schools.

Methods

Sample

Sampling was done in two stages (a) selection of sample schools from four school types-Government, Government aided, Corporation and Missionary schools under the West Bengal Board of Primary Education (b) selection of sample students.

For selection of sample schools lists of government, Government aided, Kolkata corporation and Missionary schools were collected from different sources-Calcutta District Primary School Council, Calcutta Municipal Corporation and Police stations of different areas. Data were collected from 3 Government schools, 5 schools financially aided by the Government of West Bengal, 7 schools of Kolkata corporation and 3 missionary schools under the West Bengal Board of Primary Education. In sampling, attention was paid to the equal representation of schools across north, south, east, west and central Kolkata.

Finally data were collected from 234 students of Government, 230 of Government aided, 202 of corporation and 215 of Missionary schools. Thus simple stratified random sampling was followed in sampling the students from 4 strata—5 zones of Kolkata (North, South, Central, East, and West) 4 school types.

Instruments

Reading and Writing Motivation Quesitonnaires were administered. The questionnaire includes 42 questions to measure 14 reading and writing motivation characteristics. The test retest reliablity and internal consistency of the questionnaire are very high.

Data Analysis

Correspondence analysis was made in this study in order to examine differential pattern of reading and writing motivation of children across different types of schools. Correspondence analysis (CA) is an exploratory technique to investigate the magnitude and the substantive nature of association between the row and column categories of cross tabulation rather than to confirm or reject hypothesis about the underlying process which generate the data (Greenacre and Blasius, 1994). It is the technique to display the row and column variables of a two — way contingency table graphically as points on a corresponding lower dimensional vector spaces. According to Andrews (1978) graphical display of data is comprehensible to human minds, thus uncovering structure of the data and detecting departure, if any, from the structure. CA provides a joint plots of points representing both the rows and columns of the table. In CA, instead of trying to compare rows using proportions a smaller number of coordinates are created so that each successive coordinate axis acounts for a decreasing portion of the total association between the rows and columns as represented by the familiar Pearson Chi-square statistics. The first coordinate accounts for the largest part of the total association, the second for the next largest part and so on. CA follows certain steps as (I) testing independence between row and column variables by chi-square analysis. Significance of chi-square represents that CA provides a "strong model" of the row column dependence; (II) assigning weights (mass) to the row and columns variables by dividing total row or column frequencies by the total sample size. This mass has important role in plotting the points on axis; (III) extracting factors from row and column variables by principal component analysis. Factor extraction helps in identifying a sub-space of lower dimensionality which comes close to the points presented by column and also row variables; (IV) graphical presentation of the points of row and column variables on low dimensional plane, usually two dimensional planes. Since CA follows principal component analysis of a set of row and column variables, it is expected that CA possibly would provide more information about data structure, especially closeness of row and column variables than simple frequency or percentage analysis of data. Besides, CA provides relative distribution of row and column profiles through the value of inertia. Since CA before plotting the data standardizes the frequencies of each cell there is no difficulty in analyzing the groups of different sizes. There were very few application of CA in psychological researches (Dutta Roy, 2002, Dutta Roy and Banerjee, 1998, Dutta Roy, Mukherjee and Chatterjee, 1993).

Results & Discussion

Reading Motivation

Chi-square analysis revealed that reading motivation significantly (Chi-square (60) = 411.701,

P<0.0000) varied across school types. Corporation school was more close to recognition motive category. On the other hand, missionary school was more close to achievement motive. Application and aesthetic motives were close to both Govt. and Govt. aided schools. The knowledge motive was equidistant from Missionary and Govt. and Govt. aided schools. Location of these three schools was far away from Corporation schools. This suggests that students in corporation school wanted to read in order to be recognized by others. Application of leassons in daily life, color or pictures in the book lead students of Govt. and Govt. aided schools to read more. Students in the Missionary schools preferred reading in order to develop mastery over the competency.

Writing Motivation

Chi-square analysis revealed that writing motivation significantly (Chi-square (60) = 411.701, P<0.0000) varied across school types. Result shows close proximity of affiliation and recognition motives to the point of corporation school suggesting that students in Corporation schools wanted to write in order to be loved and recognized by others. Government schools were more close to Documentation and creativity motives. This suggests that students of Government schools felt inner urge to write for maintenance of writing archives and for writing creative articles. Missionary schools and government aided schools were more close to emotional expression and achievement motives respectively suggesting that missionary school students wanted to write for expressing their own inner feelings and emotions and students of Government - aided schools wanted to write for obtaining good marks in exam.

To sum up, this study noted that schools play critical role in developing reading and writing motivation among the children.

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EDUCATION OF THE PERSONS WITH DISABILITY

Ashok Kumar Sinha *

Introduction

One of the Chinese philosopher commented that if you want to harvest for hundred years educate the people. Education has shown positive results in all aspect of human life. History of education is age old. In India starting with Gurukul tradition to ancient Nalanda to modern school, colleges and university, education has come along way. Education of children with hearing disability started in 1545 in France by a priest who first demonstrated that the persons with deafness can learn and perhaps this made beginning of the education of the persons with hearing impairment.

Hearing impairment after the natural acquisition of language and speech by the children leading to academic lag and poor social and emotional development. Binaural hearing (hearing with both ears) is essential for normal development of language and speech development. Binaural hearing helps us to locate the source and direction of the sound, discrimination of the difference of various speech sounds and gives us unique ability of extracting signal (wanted sounds) embedded in noise (unwanted sounds).

Many terminologies have been used the nature of the impact of the hearing impairment. With change of technology, better understanding, change of attitude and awareness, the terminologies have undergone remarkable changes. Present trend is to use positive and person first approach. Person with disability (Equal opportunity, protection of rights and full participation) Act 1995, quantify the loss of hearing in the better in order to qualify to make person with hearing disability as hearing loss of 60 dB or more at speech conversion frequency. All of the speech sounds are within the range of 250 Hz to 8000 Hz. Majority of speech sounds fall within the range of 500 Hz, 1000 Hz and 2000 Hz. These frequencies are known as speech frequency. Ability to hear at these frequencies also determines degree of the hearing loss. Person may have degree of hearing loss ranging from mild, moderate, moderately severe, severe or profound degree of. Hearing loss can be one ear (Monaural) or both ears (binaural).

Children acquire language and speech as of like adult by the age of 5-6 years. Thus children are ready to join elementray education.

Inclusive Education for the Children with hearing impairment

Inclusion is an educational philosophy aimed at "normalizing" special services for which students qualify. Inclusion involves an attempt to provide more of these special services by providing additional aids and support inside the regular classroom, rather than by pulling students out for isolated instruction. Inclusion involves the extension of genearl education

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curricula and goals to students receiving special services. Inclusion involves shared responsibility, problem solving, and mutual support among all the staff members who provide services to students. Inclusion describes the process by which a school attempts to respond to all pupils as individuals by reconsidering its curricular organization and provision. Through this process, the school builds its capacity to accept all pupils from the local community who wish to attend and, in doing so, reduces the need to exclude pupils (Davis, 2000).

Education of the persons with hearing impairment started as separate group, then integrated and now inclusion. Inclusion of the persons with hearing impairment can be really successful if one can have positive attitude and keeps pace with technology. Early identification of the hearing loss can significantly reduce the impact of the hearing impairment if accompanied with appropriate amplification and intervention.

Hearing impaired children do have residual hearing which can be utilized for developing language and speech skills. Pre-school programs provide such opportunity for children. AYJNIHH propagated this thought through collaboration of NGO's and its own regional centers. Recently research project has been undertaken by the Institute on early education and intervention towards inclusive education of the children with hearing impairment across India including at Kolkata.

Trainning Programs

In order to make inclusion successful, the need for the trained personnel has been felt. Teacher training program for the persons with hearing impairment has been available at pre-school, diploma, graduate and post graduate level recognized by the Rehabilitation Council of India, New Delhi. RCI recognized courses have component of regular education curriculum too both at diploma as well as degree levels. Even teaching in the regular school as part of practice teaching has also been made compulsory. RCI also have foundation course for teacher already empolyed in regular school to orient them towards disability and one can be more efficient to know some of the techniques which are not only useful for persons with hearing impairment but also for regular students.

There should be more interaction with professional and educators so that a favorable atmosphere is created to negate the attitude that dealing with persons with disability is concern of Doctors. We only make the community and each one of us have role to play in inclusive education of the children with hearing impairment. As we are still far away when it comes to inclusion, it is still necessary to redefine strategies and to seek solutions leading to a policy in which the "regular school" becomes more responsible for the education of all students, including those with hearing impairment. With advances in medical and rehabilitative science more and more children with haring impairment will be enrolled in regular school. Teacher should be aware of their needs and accomodate them in their classroom. All the teaching strategies used for persons with hearing impairment will also be more useful for others.

Classroom Acoustics

All of us experience poor speech perception if background noise is more.

Reserach has shown that students with normal hearing can understand clearly if the sound they want to hear is 6 dB louder than the background noise (signal-to-noise ratio). Students with a hearing loss need a higher SNR of about 15-25 dB to achieve the same results (Blair, 1990). Infact reducing noise level in our classroom and in community helps us to get rid

of adverse effect of noise. Classroom with good room acoustics will improve speech discrimination. The noise level within the classroom should be within 55 dbA (Sinha, 97).

Use of Assistive Listening Devices

Use of hearing aids have become somewhat visible in the classroom these day. Ministry of Social justice and Empowerment, Government of India provides under it's ADIP scheme free hearing aids or at nominal cost for persons having family income less than Rs. 8000/- per month. (Sinha, 2003).

However use of assistive listening devices have not been popular because of non-avalibility and lack of awareness among professional. ALD provides barrier free listening enviroment as public places as well as classroom. ALD's are available in Loop Induction System, FM System and Infared System. Recently cost eiffective model of CROS hearing Aid was developed for the benefit of the persons with unilateral hearing loss as well as asymmetrical hearing loss. This model of hearing aid has been successfully used by the school as well as college going students.

Operational Needs :

The operational needs for sustainable efforts towards an inclusive words shall be as follows:

i) Creating awareness to empower the household with the knowledge of hearing, hearing loss, its intervention, and proactive attitude as need of the hour.
ii) Early Identification, referrals, and diagnosis
iii) Early Intervention
iv) Provision of suitable aids and/or appliances such as hearing aid, earmolds, group hearing aid, solar charger, etc.
v) Education
vi) Employment
vii) Social Practices
viii) Prevention
ix) Ensuring sustainable outcomes

Internet for Classroom

Parents, teachers and students can take advantage of internet directly. There are two types of programmes available through internet. One is interactive and other is non-interactive. Interactive programme provides opportunity to parents/teacher/students to interact with distant teacher/expert through online programmes and also provides ways and to express their emotion and thoughts through chatting/e-mail. One of the major advantages of the online programs is the expert opinion available to many persons at a time making it a cost effective method. Teacher/parents can get regular updates for certain problems faced by them. One of such websites provides weekly updates known as Masterteacher.com, which provides Tiplist on inclusive education, maintaining, discipline in classroom/providing answers to student's query in non offensive manner.

Another website known as i4c (Internet 4 classroom) is useful for the teacher, parents as well as students. In this various programmes like power point are used to teach mathematics/

science/language to children with hearing impairment of different grades. Teacher can make her own lesson plans and can use their imagination for the purpose of learning. Free downloadable module on teaching science/mathematics/spelling/are also available.i4c is website for helping teacher use the internet effectively. It provides daily dose of the web/ Links for K-12 teacher/On-Line practice module.i4c.

Listen-Up web provides free downloadable modules of "Learning to listen sounds". Parents can interact with the professional using internet. One such web site available is elln@Auditory Verbal Training.com. Apart from family consultation it also provides "Use fast track Auditory Verbal program based on Ellen Rhoades work "road map" for infants, preschoolers, and elementary school aged kids. Professional/parents can also take basic course for certification as Auditory Verbal Therapist.

Internet provides all information related to amplification/hearing test/abstract of articles/ review of books/research articles and various professional and parents associations. Indigenously web site of AYJNIHH provides site to check your hearing, jobs for the deaf and linkages to other web sites.

Visibility

Inspite of all out efforts the large population of the persons with disability are not visible. Their enrollment in the regular school or special schools have been limited. Education for all can't be without them. Inclusion is not a privilege we are going to give to the children with disability, but it is the natural consequence of a humane society. Community, management, principal, teacher, parents and professional must be equipped to face and inhibit the attitudinal barrier that prevents the children with disability to be enrolled in regular classroom. We are backed by legislation, motivated people, awareness in community and scientific information, therefore we may make inclusion practical than theoretical process. This will make our children with hearing impairment in regular classroom more visible.

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INSTRUCTIONAL OBJECTIVES : USES IN TEACHING, EVALUATION AND TEXT BOOK WRITING

Pranab Kumar Chakrabarti *

Eversince instructional objectives were described and classified, teachers and educators find their uses restricted to classroom teaching only when they intend to teach science or mathematics. In programmed instruction, in writing lesson plans or in the construction of achievement test, some major objectives under cognitive domain are used. Very rarely some items are left for psychomotor objectives also, though without going into its details. But the labour of classifying the instructional objectives by so many scholars over a period of about twenty years still remains to be adequately rewarded when we think of its uses in the everyday activities of teachers in their regular teaching of all subjects and at all levels.

The purpose of this brief discourse is to explore the feasibility of using the essential features of the taxonomy of educational objectives in daily classroom teaching, evaluation and text book writing not only from theoretical perspective but also in practice. Before a hypothetical frame of reference is proposed it must be mentioned here that the idea expressed has its root in some assumptions upon which the conventional teaching rests but which are more a myth than reality. The first assumption inherent in the conventional teaching is that mere presence of the teacher in the classroom makes the students attentive. Students' attention is very rarely given serious thought in conventional teaching. It seems wise to assume that students in the class are variedly attentive at different parts of the lesson. The second assumption is, all students have the similar level of ability and capability of comprehension. It is due to this assumption that teachers in their classes address a hypothetical level, only a few of the students conform to that level, others simply do not. Here also we can very reasonably assume that all students do not have same ability level. The third assumption can be described as to be based on the learners' motivation and interest that they potentially possess. In conventional teaching, a teacher assumes that all students are motivated and are equally eager to listen. Therefore, they require the information, explanation and concepts in a manner the teacher presents to them. My assumption in this context is, all students do not require every aspect of the lesson at all levels of its presentation.

It is needless to say that everything discussed so far is in the context of conventional lecture based teaching which is the prime mode of teaching in our classes attended by very large number of students. The effect of the above assumptions is obvious. Many students loose interest, sometimes become disruptive and unnecessarily strive at learning outside the class only because he or she does not like to be eliminated in the examination. Naturally, the annual examinations before awarding cerificates or degrees are also primarily based on these assumptions, all students should know what the evaluators think essential for them.

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If we think of the three basic propositions that (a) the students have varying levels of attention at any given time of the lesson, (b) have different levels of ability, and (c) they do not require everything that is presented to them, we can think of a different mode of teaching, evaluation and textbook writing. In this connection, the role of textbooks in the conventional teaching must be mentioned separately.

Role of Text Book in Our Conventional Classroom Teaching

Normally textbooks are written by a teacher or a group of teachers in exact order of the contents prescribed in a syllabus. The contents are presented and explained in a manner as if the authors are teaching their invisible students. Teachers using the text books, on the other hand, follow the sequence of presentation and the contents faithfully often without considering the situational needs of the specific group of students being addressed. This mechanical approach of teaching often makes a lesson dull and ineffective. Very rarely the contents are restructured or reorganized so as to make a lesson lively and interesting. Students also become less attentive to class teaching because they know it well that what is being taught in the class may be read at home.

Text books if accepted as just a guideline for teaching and learning is attempted to be ensured in the classroom itself, there should be a different approach adopted for text book writing.

A Suggested Approach of Teaching, Textbook Writing and Evaluation

Rationale of the proposed approach lies in two fundamental ideas of current educational psychology. First, the essence of **Bruner's Sprial Curriculum** is applicable in our classroom situation also and so also the idea of presenting an advance organiser. The second, instructional objectives can be used to determine the broad levels of teaching and evaluation. Thus, the proposed approach is a synthesis of the behaviouristic and cognitive instuctional strategies in a very broad sense of the term.

Let us suppose that there are three groups of students in the class having three levels of ability, motivation and interest. Students in the lowest level want only the basic information or knowledge in a very straight forward manner, They prefer surface approach of information processing and want direct instructions. Let us call them as **knowledge group**. The next higher level students are partially inclined to deep processing of information. They want elaboration and explanation to the extent of analysis. Let us call them **analysis group**. The highest level is characterised by having good ability for critical evaluation and appreciation. This is **the evaluation group**. It is to be mentioned here, that this classification of learners is not absolute or irreversible. Once a student gets the basic information, he may be interested to go into an elaboration of the content or having analytical information may like to critically evaluate the content.

Classroom teaching may be planned according to the above mentioned categorisation of the level of interest or ability of the students. At the first instance, only the basic information may be taught as a matter of fact. The first level of evaluation may be instituted at this point and those who want to leave at this point may obtain C level certificate. Teaching, now, will take up the analysis, explanation of the facts already taught and then evaluation for B level certificate may be conducted. Lastly, those who still persist may receive teaching for critical appreciation, comparison, correlation, integration etc.

The feasibility of three level teaching may be questioned by any average teachers who usually prefer to lecture in the class without taking into consideration the ability of comprehension of the students. Also those who prefer conventional ability grouping, may think that the three levels of teaching is only feasible after separating the three groups early. The purpose of the proposed scheme of teaching is neither to have an ability grouping without any opportunity to learn nor to suggest an impracticable teaching strategy. The underlying intention is to provide all students to delve deep into the subject to be learnt systematically and step by step. Again the concept of ability grouping is based on the cognitive capability of the learners ignoring the very essential affective dispositions like need, interest, motivation etc.

The entire period of teaching in the proposed scheme should be suitably divided for the three levels of teaching. Then as it has been suggested in advance organiser model of teaching, the teacher should present the essential facts about the topic but not as briefly as it has been proposed in the conventional teaching model. The knowldege provided at the initial level must be complete in itself, factual and descriptive so that if a learner leaves at that stage he will know the essential facts about the topic. His knowledge will be tested accordingly. Subsequently, when the analytical level of teaching will be taken up, its comprehension is expected to be more easy due to sound factual knowledge and so also in the case of evaluative teaching.

Writing a Text Book

Normally text books are written in a manner the author thinks most suitable. Factual information, its explanation and analysis and critical evaluation find place in the text without considering the levels of the learners' interest. It is quite possible that the three levels can be deliberately separated from one another and be placed in the text appropriately. In that case the text book may not appear to be a conventional essay on the concerned topic but just an aid to the teacher and students supporting teaching and learning.

A major weakness of the text books used in higher education is, these are meant to serve multiple purpose. Authors expect that the text book will be read by the students of various academic levels. There are text books in which the authors have openly expressed the idea that it will be read by the students of pass course, honours and post graduate levels. In the case of school text books however, text books are specific to a particular grade level but often prefer to conform to the curriculum of different boards. But the general pattern of text book writing is almost similar. If text books are written according to the proposed form students of the appropriate level may use only the required part of the book and face evaluation accordingly.

Evaluation

Obviously, the evaluation procedure may either be a three tier system or in the same evaluation tool, three will be three probable levels. In other words, there should three sets of questions for the three levels of learners. The time allotted may vary suitably. The examples of text book content and the questions are given separately. However, these are just suggestions advanced for criticism, debate and refinement.

TEACHING SYSTEM

Bimal Chandra Das *

Teaching consists not only of communicating information but making sure it is received and understood by the recipient. Teaching is causing, guiding, directing and evaluating human learning. Teaching is rooted in learning, the two can never be separated in the actual educational process. What is learning? Learning is that form of self-activity through which, by means of experience, consciousness or behaviour is changed. Learning depends on sensation, perception, imagination, memory, association, the will, attention, interest, personality, individual needs and problems, cultural and social environment, social recognition, adjustment, achievement, attitudes, values, readiness etc.

All teaching involves manipulating the environment of a learner or making available to him an environment to which he is expected to react. The assumption is that his reactions will result in the intended modifications of his behaviours. These modifications constitute learning. Therefore, the process of teaching is concerned with teachniques and procedures for guiding and modifying student behaviour. A student comes to a polytechnic with a past history that manifests itself in the ways in which he performs at the time of his entrance. It is the task of the teacher and the polytechnic environment to enable the student to leave the polytechnic with modified ways of behaving, so that he can now read a technical book and answer questions about it, repair a piece of electric equipment, work with a machine, supervise the work of skilled labourers in an industry, do the job of a technician, do research on electronics or produce a work of art. The purpose of an educational system, with its teachers, text books, audiovisual aids, teaching machines, and so forth, is to create the conditions that will cause this new or modified student behaviour to occur. The practical task is to perform certain operations, generally referred to as "Educational Methods" or "Teaching Techniques", that result in definable changes in accordance with specified teaching objectives.

Teaching has its own forms, its own constituent elements, its own regularities. It takes place under specifiable conditions - time limits, authority relations, individual abilities, institutional structures, and so on. Teaching has sometimes been thought of as impartation of knowledge or as engaging and directing the student in problem-solving and doing a particular job. Smith's definition of teaching is sufficiently general. He thought teaching as a system of actions directed to students. These actions include explaining something with the expectation that what the teacher says will be remembered by the student, drawing a diagram and pointing out certain features of it, emphasizing that these are to be remembered, solving a problem with the help of students, asking students to solve similar problems, and so on. When the teacher behaves in these and many other ways, we say, he is teaching.

Effective teaching is so important that we can not permit teaching to continue as an art

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which each teacher must develop in his own way. It is so important that we must bring to the study and practice of teaching all of the tools, techniques, and theories available. There will be still ample scope for develöpement of individual and artistic styles of teaching - but they can be based on sound principles and organized around a systematic framework. An analytic method that has been useful in studying and improving a variety of operations is called the Systems Approach. It consists of a systematic analysis of the characteristics of the elements of the operation, the relationships that exists among the components, and the effect of variations in both of these factors on the system's outcomes. A system is a group of components integrated to accomplish a purpose. The system concept requires a clear statement of purpose and a proper integration or coordination of the parts of the system so that it accomplishes its purpose with efficiency. System development generally follows six stages.

1) The system's purpose are clearly stated.
2) Constraints are identified.
3) The functions required to accomplish the purposes within the constraints are identified.
4) Components which will carry out the functions with minimum cost are selected.
5) The system is assembled.
6) The system is measured to see if it has accomplished the purposes for which it was developed.

The teaching system can be analysed into the following components (a) Instructional Goals —the system objectives, (b) Entering Behaviour - the system Input, (c) Instructional Procedures —the system operation, (d) Performance Assessment - the output Monitor, and (e) Research and Development Logistics.

The development of the system is initiated with the specification of the goals of instruction. In an educational system, the "end-product" is the terminal behaviour of the student. The entering behaviour brought to the teaching situation is the raw material input from which the end product will be shaped. In a particular teaching situation, teaching begins with the student's entering behaviour and ends with the terminal behaviour with which the student leaves the situation. During the interval between these two points, instructional manipulations and learning experiences take place in the course of which the student emits responses which guide him toward the terminal behaviour. During a course of teaching and at its end, the performance of the students needs to be measured. Such measurement provides information about the extent to which terminal behaviours have been attained. Super imposed upon the functioning of an instructional system is the entire research and development endeavour.

WHAT IS TEACHING?

Many people, learners and teachers alike, often equate "teaching" with the formal "presentation" of material. Teaching is thus thought to be an "encounter" between teacher and pupil in, say, a lecture, a practical class, a tutorial or a kindergarten lesson. A teacher transmits "information" to a learner and the interactions that occur between learner and teacher according to this view, constitute the process of teaching.

Those who hold this view are not altogether wrong. Their concept of teaching, however, is rather narrow. Teaching *includes* elements of presentation, personal interaction and

transmission of information, but it also involves a lot more. The following definition is perhaps more useful.

> Teaching is the establishment of an environment for effective learning

This definition implies the possibility that learning can occur away from the physical presence of a teacher; that a learner can be *his own* teacher and, most significantly, that teaching involves more than "presentation". The definition suggests an element of organisation and management, and of the development of a total system. It widens the role of a teacher beyond that of a "presenter" to that of a diagnostician, planner, consultant, assessor and evaluator.

Teaching thought of in this broader way is more challenging and satisfying than the restriction to "contact" hours that the narrower definition implies.

One way of further analysing this broader definition is to compare the processes of teaching with a system of production in a factory. In a manufacturing industry, raw materials enter a factory and pass through a series of stages or processes to emerge as commercial products. Take for example, the manufacture of ball bearings.

Raw Material	Step I	Step II	Step III	Step IV	Product
Scrap Steel	Melting	Rolling	Shaping	Polishing	Ball Bearings

In such a "system" there is a known raw material, a clear objective to be attained and a carefully controlled product. Each set in the manufacturing process leads logically to the next and each must be completed before the next begins. The quality and quantity of the product are determined partly by the rate of entry and the quality of the raw material and partly by the efficiency of the various manufacturing steps. An important feature of this type of system is that the rate of output is determined by the *least* efficiency of the intermediate steps. It would be no use upgrading the efficiency of the machines which melted, rolled and shaped the steel, if the polishing machine was not quality efficient. All that would happen is that there would be a pile-up between Step III and Step IV. The output of the factory would thus be determined entirely by the capacity of the polishing machine.

While it is, of course, dangerous to stress the analogy too far there is some value in comparing teaching to a commerical production system. The danger, of course, is that the human learner is not as predictable as the raw material of a factory, nor can products or processes of education be so carefully defined as those of the steel industry.

While a good factory production line does involve assessment of product and evaluative "feedback", that is a consideration of evidence from each stage of production for possible improvements to other stages, the importance of evaluative feedback is much more significant in teaching where all elements are less certain and less rigidly prescribed. But, nevertheless, teaching does involve raw materials (the learners at the start of a program), objectives, processes, products, assessment and evaluative feedback. We can learn, too, from the systems approach that education as a whole cannot be effectively improved by just upgrading one

element of the teaching process. We won't greatly improve product, for example, merely by prescribing a new textbook. All elements of the "system" must be simultaneously upgraded if the product, the changed behaviour of learners, is to be effectively upgraded.

Teaching System

Teaching involves modification of the behaviour of an individual learner. Good teaching achieves this behavioural modification in a planned and systematic way. The new behaviours to be acquired are known and prescribed and content, strategies and resourcess necessary for most effectively achieving these changes are carefully thought through. Procedures for assessing the degree of achievement of the behavioural targets or objectives are included in the over-all plan as are methods of checking or evaluating the effectiveness of the teaching as a whole and of its individual elements. Taken in turn, the steps in the organisation of a teaching program are as follows.

Setp I. Determination of Entering Behaviour :

Before an appropriate teaching sequence can be developed it is necessary to know as much as possible about the learners for whom it is designed. What relevant public examinations have been passed? What are the past standards of achievement-straight A-s or something less? It is necessary to conduct formal pre-tests? Such information could influence the range of objectives, the selection of content and levels of attainment.

Step II. Specification of Objectives :

This is a vital step in the organisation of any teaching program. Clear statements of objectives indicate to both teacher and learner the scope of the program and the precise knowledge, skills and attitudes to be acquired and assessed.

Step III. Selection and Sequencing of Content :

With objectives determined subject matter can be selected and sequenced in such a way as to maximise the opportunity for all those in the program to achieve these objectives.

Step IV. Strategies, Groupings, Times, Spaces and Resources :

By strategy is meant the general type of teaching approach to be adopted for each topic-e.g. lecturing, small group work or practical workshop. "Method" means the precise activity involved e.g. within a small group strategy methods might include discussion, role play or answering a quiz. Only after each item of content has been matched against strategy and method can groupings and time and space allocations be considered. At this stage too, the resources required should be specified and these would include human resources and physical requirements, including learning materials. All aspects of Step IV must, of course, be fully consistent with decisions made in Steps II and III, and in full knowledge of the entering behaviours of the learners determined in Step I.

Step V. Assessment of Achievement :

The assessment aspects of a teaching program should be carefully pre-planned. They should be entirely determined by the stated objectives and be consistent with content, methods and resources. Decisions must be made about the nature of assessment its roles in grading and the process of learning. Decisions about normative or criterion referenced methods should

be clarified and the relative significance of terminal and continuous assessment made clear to all involved in the program.

Step VI. Evaluation of Training Effectiveness :

Systematic methods of obtaining information of the effectiveness of all aspects of teaching are essential elements of a good program. Ways of obtaining such information by questionnaires, tests, interviews and observational methods should be pre-planned and information obtained should be used to modify any aspects that tend to reduce the over-all effectiveness of the system.

Interactions Between Steps I to VI :

All steps in a systems model of teaching are interactive. Decisions made at any one stage of the process influence decisions made at any other stage. This implies that steps in the system are not sequential in practice and that all elements should be planned simultaneously. It shows moreover that "teaching" is a broad area of concern involving both "presentation" and "management".

MODELS OF TEACHING

Rita Sinha *

There is paradigm shift in education. The new paradigm depends upon the invention, formulation and implementation of a new theory. It is suggested by NPE 1986, "The teachers should have the freedom to innovate, to develop appropriate methods of communication and activities relevant to the needs and capabilities of and the concern of the community".

In the present century, the quantum of knowledge has become to vast. Therefore, interdisciplinary activities including research and training is needed. Klein (1996) writers that, clearly, interdiciplinary is no longer peripheral to the academy but is regarded as essential to the knowledge system.

The teachers have enough flexibility and control in configuring the courses and implementing new methods in the classroom. There is need for an open mind, a willingness to change and willngness to apply new methodology in the classroom. However it requires a clear vision, mission and milestone, to apply new technique effectively.

Model of Teaching :

Bruce Joyce and Marsha Weil (1972) formulated models of teaching. Various models of teaching have been developed from time to time to improve quality of teaching. Models have been categorised into the following familites :

1. Infomation Processing Family :

The model of teaching belonging to this family are oriented towards the information-processing capabilities of students, and the way in which they can improve their ability to master information.

(a) Concept Attainment Model (CAM) :

Bruner, Goodnow and Austin presented the Concept Attainment Model. This model of teaching is concerned with the nature of concepts themselves as well as the thinking process used by individual to learn concepts. The instructional effect of the model are : nature of concepts, improved concept-building strategies, specific concept, and inductive reasoning. The nurturant effect of this model are awareness of alternative perspectives, tolerance to ambiguity (but appreciation of logic), and sensitivity to logical reasoning in communication.

(b) Advanced Organiser Model (AOM) :

David Ausubel designed this model to increase efficiency of information processing capabilities to absorb related body of knowledge. This model includes conceptual structures, meaningful assimilation of information and ideas (all as instuctional) and interest in inquiry, habits of precise thinking (all as nurturant effect).

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(c) Inquiry Training Model (ITM) :

Richard Suchman designed this model to develop inductive mental process and academic reasoning. He is of the opinion that individuals, faced with a puzzling situation, are motivated to pursue meaning in it. This model includes scientific process, and strategies for creative inquiry as instructional effect; and spirit of creativity, independence or autonomy in learning, tolerance of ambiguity, and tentative nature of knowledge as nurturant effect.

2. Behaviour Modification Model :

The models of taching belonging to this category give emphasis on changing the external behaviour of the learners and describe them in terms of visible behaviour rather than underlying behaviour.

(a) Programmed Instuction (PI) :

B.F. Skinner and his colleague James G. Holland devised the auto-instructional method. Crowder developed automatic tutoring by intrinsic programming. The learner is able to complete the planned sequential materials at his own rate of speed.

(b) Personalized System of Instruction (PSI) :

Fred S. Keller and his three associates J.G. Sherman, Rudalfe Azzi and Careline M. Bori developed PSI or the Keller Plan. It is a Self-paced study of printed materials which provides an opportunity to the teacher to comment on relevant portions.

3. Personal Models :

The 'Personal Family' or personal development models assist the individual in the selfhood.

(a) Synectics Model :

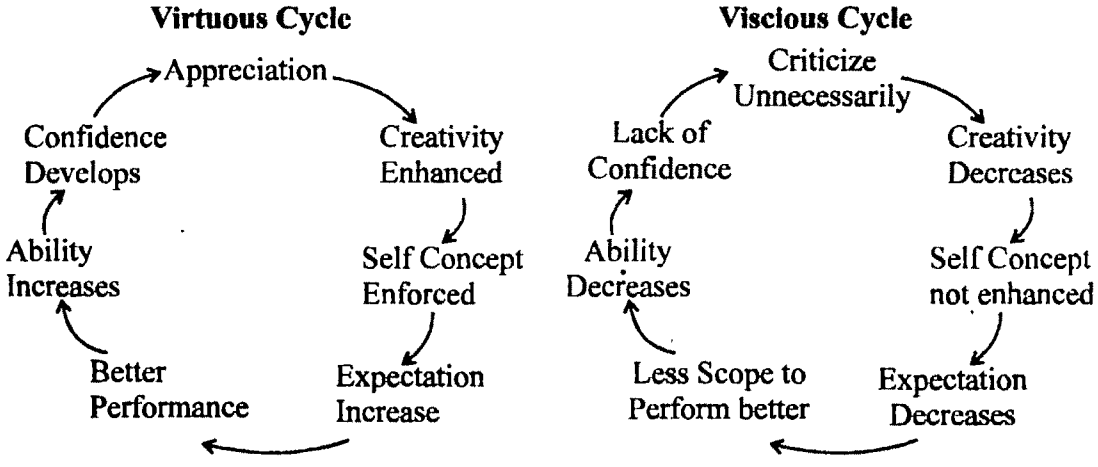
William Gordon developed this model for the personal development of creativity and creative problem solving. This model includes general creative capacity, creative capacity in subject domain (all as instructional) and achievement in subject domain, group cohesion and productivity (all as nurturant effect).

(b) Telic Theory :

Ajit Kumar Sinha (1982) maintains that a society is a system of telic persons who organize themselves to realize a number of natural or artificial goals. A social system is sustained by the telic principle. The creative and the appreciative activities of the members of a social system are guided by the telic principle. It is the principle of individuation. It guides a person in making a decision and freely choosing an alternative out of a multitude and planning for the future. It is a source of creation and appreciation of values by creative and appreciative persons. Educational strategies have to be adopted in this new civilization to evoke creative talents in learners so that they get transformed into intellectual aristocrats and superman. Creativity, then, is the supreme end of educative process.

The author of this paper developed **'Telic Model'** for nurturing creativity. Teaching can be made more effective and purposive with the help of this model. The purpose is the creative purpose of telic **(teleological)** person. It has the focus to develop creativity among the students, The syntax of this model consists in developing new, novel and unique ideas. The teacher

initiates and guides the students and provides appropriate feedback. The appreciation by the teacher acts as reinforcement. If the creativity of the students is apperciated by the teacher. it will thrive and flourish. If the teacher is unable to appreciate the creative ability of the learner, it will decline and wither away. The virtuous cycle of appreciation and the viscious cycle of criticism is shown as follows :



The teacher through his intellectual acumen, professional calibre and creative ability can metamorphose the entire system. The creative-appreciative ability of the teacher will develop desirable life skills among the students.

Conclusion :

To conclude then, the twentyfirst century is an age of academia. Teachers being the pivotal of the educational institution, provide the key to the educational system and the whole process of education revolves around them. The teacners in the present century must be abe to freely and effectively communicate with the fellow intellectuals of the world. Hence there should not only be education for preservice teachers but also re-education for in-service teachers. Qualitative improvement in teacher education will help the teachers to face the emerging challenges of globalization and liberalization.

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SCALING OF TEST SCORES

Biswanath Das *

1. The Problem

1.1 Single Examination System

In a single examination system (e.g., Madhyamik, H.S., C.B.S.E.) comprising several papers on several subjects, it is often customary to assess the overall performance of candidates based on their aggregate scores in these different papers, for the purpose of awarding ranks, or selecting candidates for admission to the next higher courses in an institution, or even sometimes recruitment in some lower grade posts.

The method is clearly unscietific, since the distributions of raw scores in different subjects with widely varing means and standard deviations. As such :

• The same raw score X in different subjects may involve different degrees of scholastic abilities and hence may not be equivalent in different subjects. It is well known and accepted that it is much more difficult to score 70 in mathematics than in English.

• The same difference d in raw scores in different subjects does not indicate the same differences in scholastic abilities. It requires much more ability to raise the score from 70 to 80 in vernacular than in physical science.

• Even in the same subject, the same difference in raw scores at different points in the range does not indicate the same difference in abilities. Thus of A,B,C.D score 20, 30, 65 and 75 respectively in, say Maths, performance of D compared to C is much more creditable than that of B compared to A, although the difference in raw scores is the same (10) in both the cases.

These indicate that raw scores are simply not additive. Any judgement based on such aggregate of raw scores is liable to injustice. The candidate declared 1st in H.S. Exam. and getting a lot of media coverage and public attention as a result, may not actually be 1st at all ! The candidate not figuring in the first 20 ranks may actually deserve to be included in the list! An applicant not selected for admission to the next higher course in a reputed college may actually be better than someone getting selected!

Remedy? The raw scores have to be properly **SCALED** under some suitable assumption regarding the distribution of the trait which the test is measuring, before these can be added to assess overall performance.

Example 1 : Suppose for simplicity, we assume that there are only 3 papers, viz., Vernacular, English and Maths of 100 marks each in a public examination. The raw score distributions are as under :

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Scores	No. of candidates in		
	Vernaclur	English	Mathematics
0–9	4	8	12
10–19	25	51	29
20–29	80	159	72
30–39	169	248	135
40–49	229	204	178
50–59	176	99	161
60-69	83	27	121
70–79	29	4	58
80–89	5	0	24
90–100	0	0	10
Total	800	800	800

The top 3 candidates have the following scores :

Subject	Raw scores of Candidates		
	A	B	C
Vernacular	81	85	86
English	72	73	79
Maths	100	92	84
Total	253	250	249
Rank	1	2	3

Is the above ranking justified?

Example 2 : In Example 1, suppose the scores of A and B, contesting for the last position in the selection list for admission to H.S. in a school are :

A : V 50+E 45+M 80 = Total 175 and

B : V 60+E 62+M 50 = Total 172.

Which of the two candidates should be selected?

1.2 Several Exam. Systems

Sometimes candidates coming from several exam systems, e.g., H.S., C.B.S.E., I.S.C. etc., apply for admission to an Hons. Course in a College.

Selection on the basis of aggregates (%) of the applicants coming from these different systems is not justifiable, since the systems are widely different in respect of course contents,

question pattern, marking system etc. As a result distribution of aggregates markedly differ across systems: means, standard deviations also differ.

Sometimes arbitrary penalties are imposed uniformly on the aggregates of all candidates coming from certain streams, say I.S.C., to ensure so called parity. This, too, is unscientific.

Remedy? Establish equivalence based on statistical considerations, among different sets of aggregates, following suitable methods of scaling.

Example 3 : Which of the two candidates A scoring 72.1% coming from H.S stream and B scoring 75.2% coming from I.S.C. stream — should get preference for admission to the next higher course?

The raw score distribution are as under (of candidates who have applied) .

Scores	No. of Candidates			
	H.S.	Cum	I.S.C.	Cum
50-54	98	98	8	8
55-59	262	360	35	43
60-64	421	781	78	121
65-69	634	1415	165	286
70-74	732	2147	286	572
75-79	528	2675	391	963
80-84	315	2990	286	1249
85-89	165	3155	193	1442
90-94	82	3237	108	1550
95-100	11	3248	29	1579
Total	3248	—	1579	—

2. Scaling Procedures

There are several procedures for scaling of test scores which are valid under different assumptions regarding the distribution of trait under consideration.

2.1 Percentile Scaling

Here we assume that the distribution of the trait under consideration is rectangular, under which we shall have percentile differences equal throughout the scale. To determine the scale value corresponding to a raw score X on a test, we have to find the percentile position of an individual with score X, the percentage of individuals in the group having a score $\leq$ X, which can be easily obtained from the score distribution, assuming that the score is a continuous variable. These will serve as the scale values of the raw scores. Regardless of the forms of the original raw scores distribution, the distribution of percentile scores will be rectangular.

Example 1 : To facilitate determination of percentile positions of candidates in different subjects, we consider the cumulative frequency distributions of less than type.

Scores	Vernacular		English		Maths	
	Freq.	Cum freq.	Freq.	Cum freq.	Freq.	Cum freq.
0-9.5	4	4	8	8	12	12
9.5-19.5	25	29	51	59	29	41
19.5-29.5	80	109	159	218	72	113
29.5-39.5	169	278	248	466	135	248
39.5-49.5	229	507	204	670	178	426
49.5-59.5	176	683	99	769	161	587
59.5-69.5	86	766	27	796	121	708
69.5-79.5	29	795	4	800	58	766
79.5-89.5	5	800	0	800	24	790
89.5-100	0	800	0	800	10	800
Total	800	—	800	—	800	—
Mean	44.86	—	37.18	—	48.37	—
SD	14.26	—	12.67	—	17.90	—

Here we should note that a score 80 really represents an interval from 79.5 to 80.5. Hence % of candidates scoring ≤ 80 is really % of candidates scoring ≤ 80.5. Hence using the table for cumutative frequencies

$$P_A(\text{Vern}) = P_{81.5}(V) = \frac{795 + \frac{5}{10}(81.5-79.5)}{800} \times 100 = 99.5$$

Similarly

P_B (Vern) = $P_{85.5}$ (Vern) = 99.75

P_C (Vern.) = $P_{80.5}$ (Vern) = 99.81

P_A (Eng.) = $P_{72.5}$ (E) = 99.65

P_B (E) = $P_{73.5}$ (E) = 99.70

P_C (E) = $P_{79.5}$ (E) = 100.00

And P_A (Maths) = P_{100} (M) = 100.00

P_B (Maths) = $P_{92.5}$ (M) = 99.13

P_C (Maths) = $P_{84.5}$ (M) = 97.25.

Hence we get the following scaled scores

	Vern	Eng.	Maths	Total	Rank
A	99.50	99.65	100.00	299.15	1
B	99.73	99.70	99.13	298.58	2
C	99.81	100.00	97.25	297.06	3

Example 2 :

Subject	Raw Scores		Percentile Scaled Scores	
	A	B	A	B
Vern	50	60	65.58	86.41
Eng.	45	62	73.55	97.14
Math.	80	50	96.05	55.26
Total .	175	172	235.18	238.81
Rank	1	2	2	1

2.2 Z-Scaling or σ - Scaling

Under this procedure of scaling it is assumed that differences in the forms of the raw score distributions may only be attributed to chance or to the limitations of the test — the distributions of the traits under consideration differ only in mean and s.d. Hence for the purpose of scaling, scores on different tests are expressed in terms of the scores of a hypothetical distribution of the same form as the trait distribution with some arbitrarily chosen mean and s.d. The transformed scores are called **liner derived scores**. In particular if the mean is arbitriarily taken to be zero and s.d. to be unity, the scores are called **standard scores** or **σ-scores** or **z-scores**. To avoid negative scores (standard), in linear derived scores, the mean is generally taken to be 50 and s.d. to be 10. Thus for a test with mean μ and s.d.σ, the linear derived score w corresponding to a raw score x is given by

$$\frac{x-\mu}{\sigma} = \frac{w-50}{10} \Rightarrow w = 50+10Z,$$

Where $Z = \frac{x-\mu}{\sigma}$ is the standard score.

It may be noted that under this liner transformation only the mean and the s.d. are changed, while the form of the original distribution is retained.

Example 1 : Let us now obtain the linear derived scores of the different candidates in different subjects. Earlier we derived the following :

Subject	**Mean**	**S.D.**
Vernacular	44.86	14.26
English	37.18	12.67
Maths	48.37	17.90

Thus the linear derived scores are

For Vernacular, w = 50+10 (x–44.86) / 14.26

For English, w = 50+10 (x–37.18) / 12.67

For Maths, w = 50+10 (x–48.37) / 17.90.

Hence the linear derived scroes for the 3 candidates are :

Subject	Linear derived scores		
	A	B	C
Vernacular	75.34	78.15	78.85
English	77.48	78.27	83.01
Maths	78.84	74.37	69.91
Total	231.66	230.79	231.77
Rank	2	3	1

Eaxmple 2 : Here the Linear derived scores are

Subject	Linear derived scores	
	A	B
Vernacular	53.60	60.52
English	56.17	69.59
Maths	67.67	50.91
Total	177.44	181.12
Rank	2	1

2.3 T-Scaling

Here we assume that the trait distribution is normal. Deviation of raw score distribution from normality is attributed to chance or limitations of the test. Taking the mean and the s.d. of the normal distribution as 50 and 10 respectively the scaled score T (in memory of Terman and Thorndike—the noted psychologistis), due to McCall, corresponding to a raw score x is obtained from

$$\Phi\left(\frac{T-50}{10}\right)=\frac{P_x}{100}$$

Where P_x is the percentile position of the raw score x, and $\Phi(.)$y the incomplete standard normal probability integral :

$$\Phi(\tau)=\int_{-\infty}^{\tau}\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}.dx$$

τ-values corresponding to given x are obtained from tables of incomplete normal probability integrals by interpolation.

Normalised scores with mean 5 and s.d. 2 are called stanine (standard nine) scores.

A transformation is non-linear if is changes the form of the distribution. Thus percentile scores and normalised scores are examples of non-linear transformation. Any form of distribution may be chosen for non-linear transformation.

Example 1 : We now derive the normalised scores of A, B, C in different subject as follows :

Subject	A			B			C		
	Score x	P_x	T_x	x	P_x	T_x	x	P_x	T_x
Vernacular	81	99.50	75.76	85	99.75	78.07	86	99.81	78.94
English	72	99.65	76.97	73	99.70	77.45	79	100.00	86.35
Maths	100	100.00	86.35	92	99.13	73.78	84	97.25	69.19
Total	253	—	239.08	250	—	229.30	249	—	234.48
Rank	1	—	(1)	2	—	(3)	3	—	(2)

Here corresponding to x = 81, P_x = 99.50

τ_1 = 2.57, P_1 = Φ (τ_1) = .9949151

τ_x = ?, P_x = Φ (τ_x) = .9950

τ_2 = 2.58, P_2 = Φ (τ_2) = .9950600

By interpolation,

$$\tau_x = 2.57 + \frac{.9950 - 9949151}{.9950600 - .9949151} x (2.58 - 2.57)$$

= 2.576

$\Rightarrow T_x$ = 50+10×2.576 = 75.76

Similarly for other x-values.

Example 2 : An exerise for you.

2.4 Method of Equivalent Scores.

Here no assumption is made about the distribution of trait under consideration.

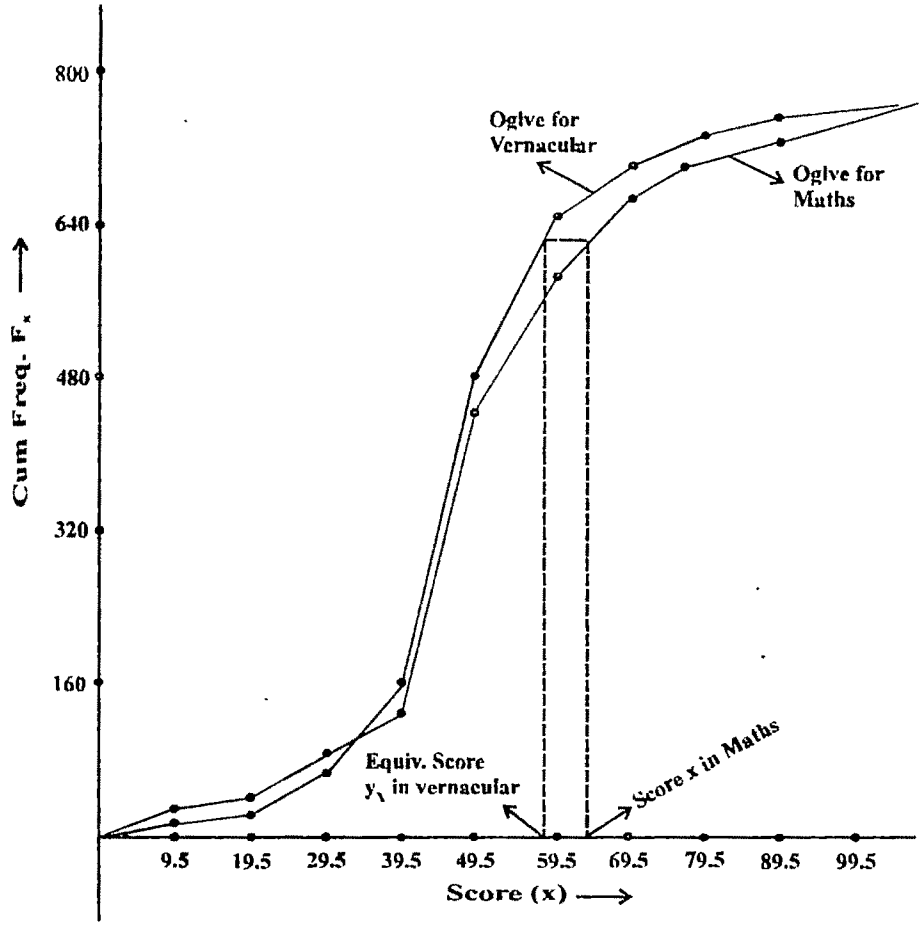
In this method, scores of a candidate in different subjects are expressed in terms of those of a standard test. Then these equivalent scores are added to get a measure of overall performance of the candidate.

Here the score x of a test will be equivalent to a score y_x of the standard test if P_x = P_{yx}, i.e. if x and y_x have identical percentile positions in the respective distributions.

Equivalent scores are conveniently obtained graphically by drawing the Ogive (cumulative freq. curve) of less than type of the score distribution of the test, side by side of that of the standard test in the same graph paper.

There are other sophisticated statistical methods of deriving equivalent scores.

Example 1 :



One can get equvalent scores by interpolation from the tables of cumulative frequencies as well.

Example 1 : Scores in Eng. and Math. for A, B & C are expressed in equivalent scores in Vernacular in the following table.

Subject	Equivalent Scores			Raw Scores		
	A	B	C	A	B	C
Vernacular	81.0	85.0	86.0	81	85	86
English	83.9	84.7	89.5	72	73	79
Maths	89.5	78.8	73.7	100	92	84
Total	254.4	248.5	249.2	253	250	249
Rank	(1)	(3)	(2)	1	2	3

Example 2 : Exercise for you!

Example 3 : Here the scaling methods discussed earlier cannot be strictly followed. However, assuming that the different groups coming from different streams are more or less of comparable standards, we can use percentile scores and equvalent scores for comparison.

A : Score 72.1% in H.S. : Percentile position 55.51

B : Score 75.2% in ISC : Percentile position 42.44.

Thus A should get preference to B, although on the basis of raw scores, reverse poicture holds.

Exercise for you : Obtain equvalent scores in H.S. corresponding to score 75.2% in ISC.

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RESEARCH DESIGN IN EDUCATION

Arun Kumar Chatterjee *

Research Design

Research Design has two basic purposes : (1) to provide answers to the questions and (2) to control variance. Designs help investigators obtain answers to the questions of research and also helps them to control the experimental extraneous and error variances of the particular research problem under study.

Research Design as Variance Control :

(a) Maximization of Experimental Variance :

The experimenter's most obvious concern is to maximize what is called **experimental variance.** i.e.. the variance of the dependent variable influenced by the independent variable or variables of the substantive hypothesis. In order to do that the experimenter selects the experimental conditious as different as possible.

(b) Control of Extraneous Variance :

The control of extraneous variables means that the influences of independent variables extraneous to the purposes of the study are minimized, nullified, or isolated. Few procedures of controlling extraneous variables are given below :

a) To eliminate the effect of a possible influential independent variable on a dependent variable, choose subjects so that they are as homogeneous as possible on that independent variable.

b) An extraneous variable can be controlled by building it into the research design as an attrilute variable thus achieving control and yielding additional research information about the effect of the variable on the dependent variable and about its possible interaction with other independent variables.

c) Whenever it is possible to do so, randomly assign subjects to experimental groups and conditions and randomly assign conditions and other factors to experimental group.

Minimization of Errorr Variance :

Error variance is the variability of measures due to random fluctuation whose basic characteristic is that they are self-compensating. Random errors tend to balance each other so that their mean is zero.

There are a number of determinats of error variance, for instance, factors associated with **individual differences** among subjects (from whom data is collected). Ordinarily it is called that this variance is due to individual differences. When such variances cannot be, or is not identified and controlled, we have to lump it with the error variance.

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Another source of error variance is that associated with what are called errors of measurement : variation of responses from trial to trial. guessing, momentary inattention slight temporary fatigue and lapses of memory, transient emotional states of subjects and so on.

Minimising error variance has two principal aspects : (a) the reduction of errors of measurement through **controlled condition** (b) an increase in the **reliability of measures.**

Experimental Designs

Basic Principles of Experimental Designs :

Professor R.A. Fisher has enumerated three principles of experimental designs : (i) the Principle of Replication; (ii) the Principle of Randomization; and the iii) Principle of Local Control.

(i) According to the Principle of Replication. the experiment should be repeated more than once. Thus, each treatment is applied in many experimental units instead of one. By doing so the statistical accuracy of the experiments is increased.

(ii) The Principle of Randomization provides protection. when we conduct an experiment, against the effects of extraneous factors by randomization. In other words, this principle indicates that we should design or plan the experiment in such a way that the **variations caused by extraneous factors can all be under the general heading of "chance".** Through the application of the principle of randomization. we can have a better estimate of the **experimental error.**

(iii) The Principle of Local Control is another important principle of experimental designs. Under it the extraneous factor, the **known source of variability,** is made to vary deliberately over as wide a range as necessary and this needs to be done in such a way that the variability it causes can be measured and hence eliminated from the experimental error.

Non-experimental Research I :

Observational, Archival and Case-Study Research —

Introduction :

Non-experimental Research : In this type of research the researcher does not have complete control over the conditions of the study. The distinction between experimental research and non-experimental research is based on the **degree of control** that the researcher has **over the subjects** and the **conditions of the research.** Key words here are **manipulation** and **assignment** versus **observation.**

An experiment is a kind of investigation in which variable is manipulated. The researcher have enough control over the situation to decide which participants receive which conditions at which times.

Non-experimental research is often called **correlational research.** In correlational research relationship are studied among variables. (without manipulation or control) none of which may be the actual cause of other. This is why all statistics books emphasize that "correlation does not prove causation".

Observational Research : Here the researcher simply observes ongoing behaviour without

attempting to influence it. This method takes two general froms : **Naturalistic Observation** and **Participant-Observer** research.

i) Naturalistic Observation : This research is conducted in such a way that the subject's behaviour is disturbed as little as possible by the observation process.

Naturalistic Observation is often called **unobtrusive research.** The term unobtrusive simply refers to the effort that researchers make not to influence, or obtrusive on, the behaviour being studied. Still another term for naturalistic observation is **non reactive research.** The term **nonreactive emphasizes** that the subjects are unaware that they are being studied and therefore do not react to the presence of the observer.

One broad category of unobtrusive measures is konwn as **physical trace** measures. These measures make use of physical evidence of some behaviour.

Participant Observer Research : Here investigators participate in naturally occuring groups and record their observations.

Archival Research : In this method, the data from existing records or archives are examined to test hypotheses about the causes of behaviour.

Case Studies : Case studies often include the use of observation and archival method logics. Case studies tend to involve an ongoing situation that presents itself for investigation.

Non-experimental Reserch II : Survey Research

Survey research is conducted on a representative sample group by adminisitering well structured questionnaire prepared according to the purpose.

True Experiments : Single Factor Designs :

In a **true experiment :** the experimenter has complete control over the experiment : the **who, what, when, where** and **how.**

Control over the Who : The experimenter can assign subjects to conditions randomly.

Control over the What, When, Where and How of the experiment means that the experimenter has complete control over the way the experiment is to be conducted.

Quasi Enperiment : A quasi experiment by contrast, is an experiment in which the investigator lacks the degree of control over the conditions that is possible in an experiment [Detailed discussion in seperate page].

Experimental Designs :

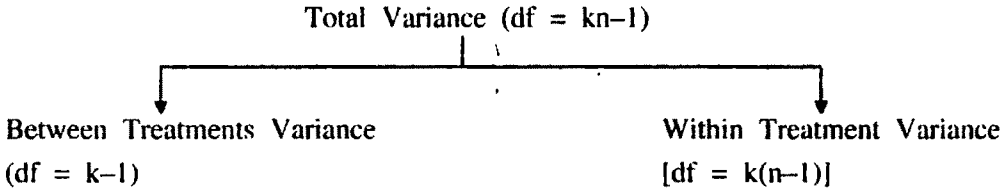
1) Completely Randomized Design (CRD) or Multiple Group Design.
2) Randomized Block Design (RBD).
3) Latin Square Design (LSD).

i) Completely Randomized Design : (CRD)

In this design 'nk' number of individuals are selected from population (where 'k' is the number of treatments and 'n' is the number of individuals to be assigned under each treatment). Then from 'nk' number of individuals 'k' groups (each consists of 'n' individuals) are formed by random method. Now these 'k' groups are allotted under 'k' number of treatments by random method.

It is not necesary that equal number of individuals (n) should be allotted under each treatment but it should not differ much.

Partitioning of Total Variance and df



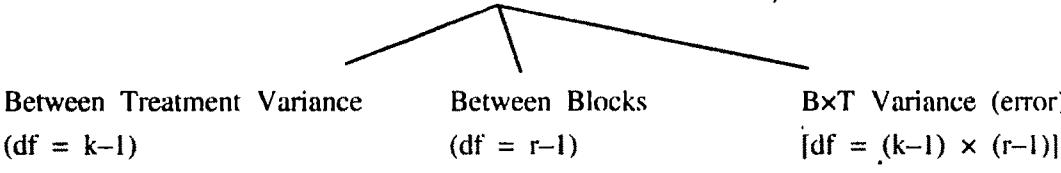
This design involves only two principles viz., the **principle of replication** and the **principle of randomization** of experimental designs. This design is generally used when experimental units are homogeneous.

Randomized Block Design (RBD) :

This design is an improvement over the CR design. In the R.B. design the principle of local control can be applied along with the other two principles of experimental designs. In this design, individuals selected randomly are first divided into groups known as blocks, such that within each group the subjects are relatively homegeneous in respect to some selected variable to be controlled. The number of subjects in a block would be equal to the number of treatments and individuals in a block would be assigned under treatments randomly. In R.B. Design the data are analysed by the two way analysis of variance.

Partitioning of the Total Variance and df

Total Variance (df = Kr–1)



Where, k = number of treatments, r = number of blocks, kr = Total number of individuals.

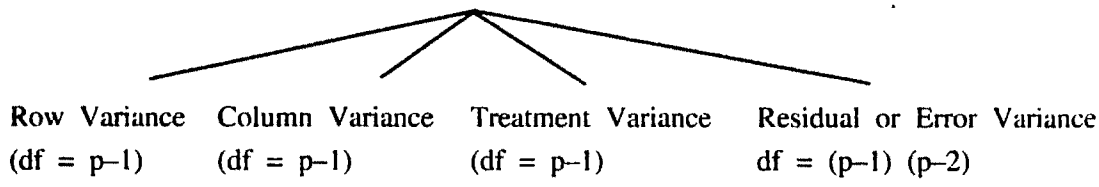
Latin Square Design

Randomized Block Design is an improvement over Completely Randomized Design, in the sense that the elimination of Block variations (Row variations) provides control over the error variance. In Latin Square Design we can eliminate two sources of variation, generally called row and column effects.

In this design, the number of treatments equals the common replication number of a treatment. So letting 'm' stand for the number of tratments as well as the number of replications for each treatment the total number of experimental units for this design is m×m. These m^2 units are arranged in 'm' rows (one source of variation) and 'm' columns (second sources of variation). Then the 'm' treatments are allotted to these m^2 units at random, subject to the condition that each treatment occurs once and only once in each row and each column. The layout of 4 treatments (A,B,C & D) in a 4×4 Latin Square design are given below :

A	B	C	D
B	C	D	A
C	D	A	B
D	A	B	C

Partitioning of Total Variance and df of p×p Latin Square



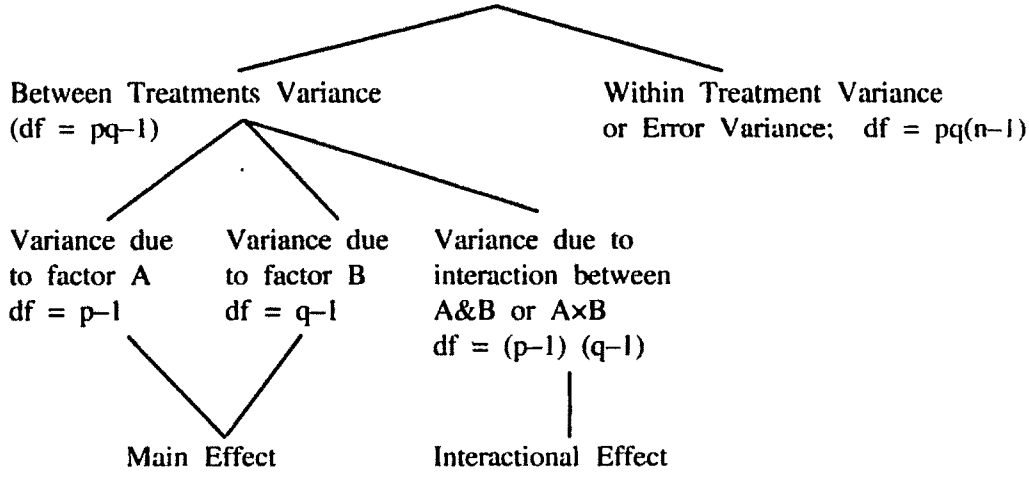
Factorical Design

Factorial Designs are used in experiments where the effects of varying more than one factor are to be determined. Factorical designs can be of two types **i) Simple Factorial Designs** and **ii) Complex Factorical Designs**

i) In case of simple factorial designs, we consider the effects of varying two factors on the dependent variable. Simple factorial design is also termed as a "**two-factor-factorial design**'. The name of the simple factorial design is also determimed by levels of two factors. If the 'p' levels are chosen for first factor (A) and 'q' levels for second factor (B) then the factorial design is called 'pxq' factorical design : 'p' and 'q' vary from '2' to any number (which is feasible to conduct the experiment).

In 'pxq' factorial design there will be pxq treatment combinations. If 'n' individuals are assigned randomly to each of 'pxq' treatment then the total number of required individuals would be nxpxq which would be selected from Population.

Partitioning of Total Variance and df



ii) Complex Factorial Design : Experiments with more than two factors at a time involve the use of Complex Factorial Designs. If there are 3 Factors (A, B & C) and p, q, r are the levels of 3 factors respectively then the factorial design is called pxqxr factorial design. Like simple factorial design if 'n' individuals are assigned randomly to each of pqr treatment combinations then the required number of individuals would be 'npqr' which should be selected from population by random method.

QUALITY ASSURANCE THROUGH TOTAL QUALITY MANAGEMENT IN HIGHER EDUCATION

Srutinath Praharaj *

The concept of quality has been with us since the beginning of time. Artisans' and craftsmen's skills and the quality of their work are described throughout history. Typically the qulity intrinsic to their products was described by some attribute of the products such as strength, beauty or finish. Quality, particularly the dimensions of component parts, became a very serious issue because no longer were the parts handbuilt and individually fitted until the product worked. Consumers describe quality by the characteristics of the product or service they acquire : It works, it is durable, it is available, service is good, and employees are courteous.

Quality is a verb, not a noun (personal communication). As such, TQM is not a passive descriptive term but an energetic activity—that of continuous process improvement. The five key ingredients for continuous process improvement are honesty, shared vision, patience, commitment, and TQM theory. Only the TQM theory can be taught and learned. The remaining ingredients require a different type of personal and organizational commitment.

Many colleges and universities across the country have adopted or are adopting the philosophy of continuous improvement in portions of their operations. All have made major commitments and are beginning to see improvements in processes across their campuses. Several other colleges and universities are just beginning the process. Focusing on processes indirectly impact the student. However, improvements in these areas affect the general quality of life on the campus, the morale of the staff, the culture of the university, and consequently the attitudes of the people in the organization toward their student customers. These organizations have made a conscious and public decision to get better and better at what they do and how they treat people. They have made a decision to change from their existing cultures to a culture in which people are valued. Change has become a way of life, processes are analyzed and reengineered, process performance is measured regularly, and the resulting quality gains are celebrated. The public celebration of the qulity gains made is an important ingredient in moving the university culture toward one that embraces the continuous improvement philosophy.

How can one get started?

→ Talk to faculty members who are trying different strategies of instruction. Discover the effect these strategies have had on these faculty members' classes. Educational research clearly shows that only a few instructional strategies will lead to large (greater than two standard deviations) increases in student learning. These include the use of a mastery learning model with re-teaching and retesting, instructor or peer tutoring, collaborative/participative learning (e.g. teams), and the uses of new technologies such as multimedia and the Internet.

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→ Just do it. Try a new method for a teaching a course topic. You needn't do a whole course. Remember, improvement comes step by step. Apply the PDCA model. Measure the resulting student learning. If you feel it works and can be further refined, continue to do so. If it clearly doesn't work, try something else. Ask the students if something is working or not and what they think might work. Use their ideas.

Classroom Teaching and Student Learning

Clearly, the teaching and learning that take place within a course is a process, albeit a complex one. The product of the process is the learning of the student. Primary team members in the process are the professor and the student. Many other team members also exist in this complex system, including librarians, other faculty members, tutors, lab assistants, and other students. The businesses, industries, and professions served are also team members because they help to identify relevent course content. Maintenance and custodial personnel are team members because they have a direct effect on the quality of the learning environment. The professor, based on his/her experience and expertise, develops the plan for learning and a process that results in student mastery of the course material.

We must consider alternatives to many of our current educational practices. For example, we could—

- change our current grading practices to reflect the opportunity for imporvement, such as retakes on tests, mastery learning, and outcomes-based evaluation.
- adopt the philosophy that all students can learn and that our goal is to develop teaching/learning strategies that will lead us toward zero defects—no failures.
- believe that intelligence is the rate of learning and that natural variability exists in this—process like all others and can be accounted for inappropriate teaching/learing strategies.
- consider published outcomes and guarantees in courses.
- examine policies at the university that inhibit a CQI (Continuous Quality Inprovement).

For most faculty members today, the primary instructional process is based on the lecture. They learned the material this way, as did the person they learned it from, and likewise, the instructors before them. This process continues in spite of the fact that most faculty members know that the lecture is one of the least effective ways to deliver instruction, even when it is done extremely well.

Our goal, as educators, must be to change our teaching/learning process from one which is dependent on inspection to obtain quality to one in which the teaching/learning process itself guarantees quality. Application of the TQM/CQI philosophy can move us toward that goal.

RECENT TRENDS OF CURRICULUM DEVELOPMENT IN MATHEMATICS

Satyendra Nath Giri *

Curriculum Development aims at taking innovative and developmental steps mainly in regard to modification of objectives, developments of contents and methods, preparation of instructional materials, improvement in the strategies of evaluation and the like. Mathematics being an abstract subject needs special care for its nurture.

Utilitarian and egalitarian trends of recent trends have urged to change contents and methods of teaching mathematics in a big way. Knowledge explosion both in mathematics and in pedagogy have in fact revolutionised the arena do changes which tend to cater the needs of students, teachers and the society of modern era. Changes in the area of instructional materials are also huge. The strategies of evaluation have also been substantially modified. Evaluation of curriculum of mathematics have become urgently necessary at reasonable intervals or periods.

As regards goals of teaching mathematics, it has been observed that more applied and applicable mathematics is being given while more theories and recursive reasoning have been emphasised. Modernists advocate teaching from applications to theories rather than from theories to applications. Flexibility in content selection rather than rigidity in it is also being proposed by them. Stress on needs for all rather than on only academicians and specialists is being given more importance. It is also being proposed to remove gender discrimination in teaching mathematics.

In content development the main features are algebraisation of arithmetic, inclusion of unifying topics, integration of mathematical topics (horizontal and vertical), inclusion of more realistic problems rather than artificial ones, inclusion of need based topics and rejection of deadwoods and the like. History of mathematics and fun mathematics may be included as content areas of mathematics. Relevant components of computer use may also be included in the syllabus.

Changes on methodology are also important. The main aspects of modern methodologies are the following : interactive methods through problem solving approach, open ended and creative learning, cooperative learning and team teaching, self study and self-learning, teaching relevant mathematics, teaching integrated mathematics removing compartmentalisations, taking special care for the averages, the maladjusted, underachievers, low-achievers and the disadvantaged, enriched teaching of the talented students, stress on doing and activities discouraging cramming and private tuition and encouraging the development of 'courage to ask'.

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Special attention need to be given the preparation of instructional materials, e.g. textual materials, booklets meant for different groups of students with varying abilities, improvised teaching aids, audio & video, materials and accessibility to computer use.

Recent techniques of evaluation and assessment are inclusion of application oriented problems, instant assessment of class work, evaluation through quiz and quest, objective based testing, teaching though diagnosis and remedies, learning through testing, emphasis on part marking, stress on why and how type questions etc.

Different aspects of innovations are to be well thought-out by teachers and experts through implementation assessment and feed back. Realistic procedure is likely to come out from the interaction and feedback.

A NEW ERA TO HEARING-IMPAIRED CHILDREN

Basudev Banerjee *

Human being is endowed with numerous abilities—mental, intellectual, social, temperamental, motivational, attitudinal etc. But still some persons are found deficient in some abilities. Sociological, inherital and various environmental factors are responsible for the deficiencies of the children. They suffer even from prenatal stage as a result of which they are born with several handicaps in mental and even in physical aspects. Those children who suffer from physical handicaps are termed as physically handicapped and the other categories of children who are mentally disordered are called mentally handicapped.

The handicapped persons may be classified in several groups, viz. (a) blind, (b) partially blind, c) deaf, d) hearing impaired, e) educationally subnormal, f) epilectic, g) maladjusted, h) delicate and physically handicapped, i) pupils suffering from speech defect, and j) pupils suffering from more than one handicap. Our study is to discuss speech and hearing impairment of school going children.

Hearing is a natural phenomenon whereas speech has to be acquired. Language and speech are the two main avenues for the human beings to communicate with others. So a child when born deaf becomes a mute, since he has not heard any sound for accumulation and future reproduction. This results into his inability to speak. They have the ability to feel and understand but they cannot express their feelings through language.

Hearing impairment is defined as a hearing loss which hampers oral-aural communication. According to Acoustical Society of America, 1982, there are five audiological categories of hearing impairment they are :

i) Slight hearing impairment (27 dB to 40 dB)

ii) Mild hearing impairment (41 dB to 55 dB)

iii) Moderate hearing impairment (56 dB to 70 dB)

iv) Severe hearing impairment (71 dB to 90 dB)

v) Profound hearing impairment (91 dB & greater)

dB is deci Bell, the unit for measurement of intensity of sound.

The speech and hearing impaired children face different problems in the society. The hearing impaired people have problems in receiving meaningful human communication, the speech impaired people have problems in sending it. They cannot mix with the normal persons for their language problem. They suffer from inferiority complex.

The problems have been solved to some extent with the invention of hearing aid which has established a new era to speech and hearing impaired children. As soon their deafness

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is detected, hearing aid is supplied and applied to them. As they receive sound waves, they can exercise they tongues and thus speech is developed.

From the studies of different researchers it has been found that intelligence, self-concept, capacity for social adjustment and creativity of hearing and speech impaired children can be assessed. Group Intelligence Test developed by Kapat (1956), Self-Concept Questionnaire and Social Adjust Questionnaire developed by Banerjee (1993) and the Non-Verbal Test was developed by Biswas (1983) in the model of Minnesota. Non-Verbal tests are preferred in order that the speech and hearing impaired persons are not unduly penalized because of language factors.

For a comparative study the tests and questionnaires are administered on the hearing impaired and the normal school-going children of Class V. Through statistical analysis and observation it has been found that with respect to intelligence the speech and hearing impaired children are at par with the normal ones. So the hearing impaired students might live in the society with similar type of confidence and aspiration. The society should not neglect them in any way, but should encourage them to march forward with same speed and courage with the normal counterparts.

It has also been verified that the hearing impaired students are a bit superior to the normal counterparts in respect of self concept. The general notion that the hearing impaired students possess less self-determination, will power, beliefs and conviction than the normal students have been found non-tangible. So the society should rely on the trustworthiness and stability of the speech and hearing impaired students.

The results show that the normal students posses more capacity for social adjustment than the hearing handicapped children. So more scope should be provided to the speech and hearing impaired children in teaching, conversing, mixing and exchanging thoughts and ideas with the teachers, parents and the peers.

The statistical observations also show that the speech and hearing impaired students are at par with the normal ones with respect to creativity. So the former students should be placed in the society, in the vocations and higher education.

In the present age, the introduction of 'Integrated Pattern of Education' for the speech and hearing impaired children, has opened a new era. They are capable of receiving education along with the normal ones. It is their fundamental right.

তথ্য প্রক্রিয়াকরণ শিক্ষণ তত্ত্ব (Information Processing Theories of Teaching)

মলয় কুমার সেন *

তথ্য প্রক্রিয়াকরণ শিক্ষণতত্ত্বের সরল বৈশিষ্ট্য হল এখানে নির্দেশদান সিরিজের একটি চক্রের (Cycle) পুনরাবৃত্তি হয়ে থাকে। প্রত্যেকটি চক্রের সঙ্গে দুটি স্তর জড়িত রয়েছে :—

1. নির্দেশদানমূলক পরিবেশকে শিক্ষক এমনভাবে নির্বাচিত ও সজ্জিত করেন যাতে যেসব শিক্ষার্থী নির্দেশদান ক্রিয়াতে অংশগ্রহণ করে, তারা বিশেষ প্রক্রিয়াকরণ জ্ঞানমূলকভাবে করতে নির্দেশনা লাভ করে।
2. এই সব জ্ঞানমূলক প্রক্রিয়াগুলি সম্পাদন করে শিক্ষার্থীরা বিষয়বস্তু সম্পর্কে তাদের নিজস্ব জ্ঞানমূলক প্রতিনিধিত্ব (Cognitive Representations) সৃষ্টি করে।

শিখন স্ট্র্যাটেজি, অহং ধারণা (Self-concept) এবং বিভিন্ন নির্দেশদান কার্যাবলির ফরম্যাট ও আদর্শমান অনুযায়ী অংশগ্রহণ করার ব্যাপারেও তারা একই সঙ্গে জ্ঞানমূলক প্রতিনিধিত্ব উৎপাদন করে।

নির্দেশদানের কার্যকারিতা বিচারকরণ (Judging the Effectiveness of Instruction) :

নির্দেশদান সঠিকভাবে কার্যকর হয়েছে কি না তা বিচারকরণের জন্য তথ্য প্রক্রিয়াকরণ শিক্ষণতত্ত্ব তিন প্রকারের অগ্রগতি (Achievenments) বিবেচনা করে থাকে :

(i) যখন শিক্ষার্থীদের তথ্য সংক্রান্ত মানসিক প্রতিনিধিত্ব সঠিক, যথাযথ এবং সম্পূর্ণ,

(ii) যদি ভবিষ্যতের কোনো টাস্ক সম্পাদন করার জন্য তথ্য পুনরুদ্রেকের প্রয়োজন হয়, তারা তখন তথ্য স্মরণ করতে পারে, এবং

(iii) যখন শিক্ষক ও শিক্ষার্থী কর্তৃক সুনির্দিষ্ট করা উদ্দেশ্যাবলি অর্জনে কোনো বিশেষ টাস্ক সম্পাদন করার জন্য তথ্যকে ব্যবহার করাতে শিক্ষার্থীরা অনুপ্রাণিত হয়।

এই সব বিষয় অনুযায়ী বিবেচনা করা হলে তথ্য প্রক্রিয়াকরণ শিক্ষণতত্ত্ব অবশ্যই দুটি ইস্যুর দিকে নজর করবে:—

(i) শিক্ষার্থীরা কীভাবে জ্ঞান অর্জন, স্মরণ ও প্রয়োগ করে থাকে,

(ii) নির্দিষ্ট নির্দেশদানের মাধ্যম বিশেষ ধরনের জ্ঞানমূলক প্রক্রিয়াকরণ টাস্কে নিযুক্ত হওয়ার জন্য কীভাবে নির্দেশনা লাভ করে এবং এই সমস্ত জ্ঞানমূলক প্রক্রিয়া চলাকালীন কীভাবে ধারাবাহিক টাস্কসমূহে শিক্ষণ কার্যটি শিক্ষার্থীর শিখন সমর্থন করে।

উপরোক্ত দৃষ্টিভঙ্গি গবেষণাভিত্তিক তত্ত্ব ও মডেলের উপর দৃষ্টিকে কেন্দ্রীভূত করে। এগুলি শ্রেণিকক্ষে শিক্ষণ এবং পাঠ্যপুস্তক ও কম্পিউটর সফট্ওয়্যারের মাধ্যমে স্বশিক্ষণকে বর্ণনা করার উপর জোর দেয়। শিক্ষক ও তাঁর বিভিন্ন বিকল্প প্রতিনিধিসমূহ (Surrogates) (যথা—পাঠ্যপুস্তক, কম্পিউটর সিস্টেম ইত্যাদি) শিক্ষার্থীদের অগ্রগতির হার ত্বরান্বিত ও উন্নীত করতে তাদের জ্ঞানমূলক প্রক্রিয়াকরণে নিযুক্ত করতে ও নির্দেশনা সরবরাহ করতে কীভাবে সাহায্য করবে তার উপর গুরুত্ব আরোপ করে। জয়সি ও তাঁর সহকর্মীবৃন্দ (Joyce et al. 1992)-এ ব্যাপারে বিস্তৃত আলোচনা করেছেন।

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* রিডার, শিক্ষাবিজ্ঞান বিভাগ, কলিকাতা বিশ্ববিদ্যালয়।

1. জ্ঞানমূলক মধ্যস্থতাকারী প্যারাডাইম (The Cognitive Mediational Paradigm)

যে-কোনো নির্দেশদান সেটিং-এর প্রারম্ভিক জ্ঞান শিক্ষার্থী নিয়ে আসে। প্রারম্ভিক জ্ঞান হল তার প্রবণতা—(Aptitude) কীভাবে শিক্ষার্থীরা সেটিং প্রত্যক্ষণ করছে ও নির্দেশদানের অন্তর্নিহিত কার্যাবলিতে অংশগ্রহণে তাদের আনতি (Inclination) কী রকম এবং অংশগ্রহণের মাধ্যমে তারা কী শিখতে সক্ষম হবে—এই দুয়ের মধ্যে মধ্যস্থতা করে শিক্ষার্থীর প্রবণতা (Winne, 1985)।

তথ্য প্রক্রিয়াকরণ শিক্ষণতত্ত্ব প্রারম্ভিক জ্ঞান ও নির্দেশদান কার্যাবলিতে অংশগ্রহণের মাধ্যমে শিক্ষার্থীরা যে জ্ঞান অর্জন করবে—এই উভয় টাইপের জ্ঞানকে শ্রেণিবিন্যস্ত করে। জ্ঞানের দুটি প্রধান ক্যাটিগরি হল **ধারণামূলক জ্ঞান (Conceptual Knowledge)** এবং **অধিজ্ঞানমূলক জ্ঞান (Metacognitive Knowledge)**।

(i) **ধারণামূলক জ্ঞান (Conceptual Knowledge)** : পাঠ্য বিষয়বস্তু—ফ্যাক্ট, নীতি, নিয়মাবলি, ফ্রেমওয়ার্ক ও ধারণাজট (Schemata) ও মৌলিক দক্ষতা নিয়ে গঠিত তথ্যাবলি হল ধারণামূলক জ্ঞান।

(ii) **অধিজ্ঞানমূলক জ্ঞান (Metacognitive Knowledge)** অধিজ্ঞানমূলক জ্ঞানের অন্তর্গত হল :

(a) **শিক্ষণের পদ্ধতিসংক্রান্ত তথ্যাবলি (Information about methods of teaching)—**
জ্ঞানমূলক স্ট্র্যাটেজি এবং জ্ঞানের প্রচেষ্টার দিক্ নির্দেশিত করা হল স্বয়ং নিয়ন্ত্রণ (Self-Regulation)। এটি করা হয় নির্দেশদানমূলক পরিস্থিতির অভ্যন্তরে, যা শিক্ষক বা তাঁর বিকল্পরা সৃষ্টি করে থাকেন।

(b) **আত্ম তথ্য (Information about Self) :**
স্বীয় পছন্দ, মনোভাব, শক্তি, দুর্বলতা, প্রেষণা, অনুভূতি ইত্যাদি সংক্রান্ত তথ্যাবলি।

(c) **টাস্ক সংক্রান্ত তথ্য (Information about Tasks) :**
টাস্ক সমূহ, কীভাবে সংগঠিত করা হয়েছে, কীভাবে সেগুলি উন্মুক্ত করা হবে এই সংক্রান্ত সকল তথ্যাবলি, এবং

(d) **লক্ষ্য সংক্রান্ত তথ্য (Information about Goals) :**
শিক্ষার্থীদের নিজেরা যে লক্ষ্য স্থির করেছে এবং সেই লক্ষ্য কিভাবে অর্জন করা হবে তার পরিকল্পনা সংক্রান্ত তথ্য। শিক্ষার্থীদের পূর্বজ্ঞান তথ্য প্রক্রিয়াকরণে সাহায্য করে বা সেটিতে নাক গলায় এবং এইভাবে তাদের অগ্রগতিকে সহজতর করে বা সেটিতে বাধা প্রদান করে।

উপস্থাপনা কৌশল (Techniques of Presentation) :

নির্দেশদান চলাকালীন শিক্ষক বা তাঁর বিকল্পরা বিষয়বস্তু সংক্রান্ত তথ্য যা শিক্ষার্থীরা শেখে তা উপস্থাপন করেন [**উন্মুক্ত মডেল (Explicit Model)**] বা তথ্যকে বিষয়বস্তুর অন্তর্নিহিত করে এবং টাস্ক সম্পূর্ণ করার জন্য শিক্ষার্থী এই সব তথ্য অনুসন্ধান করে [**অনুসন্ধান মডেল (Inquiry Model)**]। শিক্ষক বা তাঁর বিকল্পরা তথ্যও সরবরাহ করেন, শিক্ষার্থীকে ধারণামূলক ও অধিজ্ঞানমূলক তথ্যাবলির প্রক্রিয়াকরণে সংকেত প্রদান করেন বা নির্দেশনা (Giving cues or guidance) দিয়ে থাকেন। যেমন, কোনো কার্যকলাপ বা পাঠ্যবিষয়ের বিশেষ অধ্যায়ের শিরোনাম কিছু জিনিস উন্মুক্ত করে যা নিয়ে নির্দেশদান সেসন সংঘটিত হচ্ছে। এটিই হল বিষয়বস্তু সংক্রান্ত তথ্যাবলি। এই শিরোনামের মধ্য দিয়ে শিক্ষক শিক্ষার্থীদের কাছ থেকে বিশেষ জ্ঞানমূলক রুটিনে শিক্ষার্থীদের নিযুক্ত করতে পারেন। অথবা শিক্ষার্থী আগাম যে ধারণা ভবিষ্যদ্‌বাণী করেছিল তাকে দৃঢ় করা, সংশোধন করা বা নাকচ করতে পারে।

শিক্ষক বা তাঁর বিকল্পরা নিজস্ব যে ব্যক্তিগত অর্থ বা প্রতিনিধিত্ব (Personal Representation) করার জন্য নির্মাণ করতে উপস্থাপন করেন, শিক্ষার্থীরা বিষয়বস্তু সংক্রান্ত তথ্যের সে ভাবে তাৎপর্য নির্ণয় করতে পারে। শিক্ষার্থীরা অবশ্য নির্দেশদান কার্যকলাপ উন্মুক্ত করার সঙ্গে সঙ্গে নির্দেশনার উপযুক্ত ব্যবহার করে তথ্যের জ্ঞানমূলক প্রক্রিয়াকরণ (Cognitive Processing) করতে পারে। সুতরাং নির্দেশদানমূলক ঘটনাবলি যা শিক্ষক সংগঠিত করেন এবং শিক্ষার্থী

নির্দেশদান ক্রিয়াতে অংশগ্রহণ করে যে অগ্রগতি অর্জন করে, এদের মধ্যে সংযোগগুলির (Links) মধ্যস্থতা করে শিক্ষার্থীর পূর্বজ্ঞান (Winne এবং Marx, 1987; Snow 1992)। তথ্য প্রক্রিয়াকরণ শিক্ষণতত্ত্ব সম্বোধন করে, কীভাবে তত্ত্ব কর্তৃক ভবিষ্যদ্‌বাণী করা প্রভাবকে শক্তিশালী, দুর্বল বা বিকৃত করে।

তথ্য প্রক্রিয়াকরণ শিক্ষণতত্ত্বে সাধারণত অনুমান করে নেওয়া হয় যে, শিক্ষার্থীরা শিখনের প্রতি অত্যন্ত মনোযোগী ও অনুপ্রাণিত এবং পাঠকে সুনির্দিষ্ট টাইপে নিয়ে আসার জন্য ক্রিয়াকলাপের যে কাঠামো করা হয়েছে তারা সে সকল নিয়মাবলি ভালোভাবে অনুসরণ করবে। যে পরিমাণে ওইসব শর্তাবলি পূরণ করা হয় না, শিক্ষণতত্ত্বের শক্তি বা কার্যকারিতা সেই পরিমাণে হ্রাস পেয়ে থাকে।

2. শ্রেণিকক্ষে উন্মুক্ত শিক্ষণ (Explicit Teaching in Classroom)

দীর্ঘদিনব্যাপী ও মৌলিক শিক্ষণ মডেলের অন্যতম হল উন্মুক্ত শিক্ষণ। এই ধরনের শিক্ষণের প্রধান উদ্দেশ্য হল শিক্ষার্থীর জ্ঞানকে বিস্তৃত করা। শিক্ষার্থীরা সেটি করার জন্য পূর্বজ্ঞানের সঙ্গে তথ্য, ধারণা, নীতি, মৌলিক দক্ষতাসমূহ ও অন্যান্য ধারণামূলক জ্ঞানকে যোগ করে (Gagne et al 1992)। উইনি (Winne, 1985) বর্ণনা করেছেন এই মডেলের নিম্নলিখিত উপাদানগুলি থাকবে :

উন্মুক্ত মডেলের উপাদান (Elements of Explicit Model)

শিক্ষার্থীদের যে সব লক্ষ্য অর্জন করতে হবে ইনস্ট্রাক্টরের সঙ্গে সেগুলিকে নিয়ে পাঠ সেসন শুরু হবে। এই লক্ষ্য শনাক্তকরণ তথ্য সকল সরাবরাহ করে; এগুলি শিক্ষার্থীরা ব্যবহার করে :—

(a) পাঠ চলাকালীন প্রগতি নিয়ন্ত্রণ করতে এবং

(b) শিখন চলাকালীন তাদের তথ্য প্রক্রিয়াকরণে নির্দেশনা দিতে উপায়—প্রান্ত বিশ্লেষণ (Means—Ends Analysis) পদ্ধতি প্রয়োগ করেন (ফ্রেডারিকসন, 1984)। তারপর প্রাক্-প্রয়োজনীয় জ্ঞানের পর্যালোচনা করা হয়। এর সাহায্যে বিষয়বস্তুর তথ্যকে আরও বিস্তৃত করে সংগঠিত করে তোলার জন্য সমস্ত পূর্বজ্ঞানকে সম্মিলিত করা হয়। এইসব কাঠামোগুলি পূর্বজ্ঞানের সঙ্গে বর্তমান পাঠে যে সব নতুন বিষয় উপস্থাপন করা হয়েছে সে সব একসঙ্গে গলিত করে (Fuse)। এই পর্যালোচনা শিক্ষার্থীকে শিখন পুনরুদ্রেক করায় এবং পরবর্তী তথ্যগুলির জ্ঞানমূলক প্রক্রিয়াকরণে স্বয়ং নিয়ন্ত্রণকারী স্ট্র্যাটেজি গঠন করতে সহায়তা করে।

তারপর নতুন বিষয়বস্তু অল্প করে ধাপে ধাপে উপস্থাপন করা হয় শিক্ষার্থীদের কার্যকর স্মরণ ক্ষমতার উপর অতিরিক্ত বোঝা চাপানো পরিহার করে। খুঁটিনাটি, প্রাঞ্জল ব্যাখ্যা এবং নিয়মাবলির প্রতিপাদন সরবরাহ করা হয় যাতে শিক্ষার্থী পূর্বজ্ঞানের সঙ্গে নতুন তথ্য জুড়ে বিস্তৃত ধারণাকে আরও সমৃদ্ধ করে তোলে। প্রতিপাদন চলাকালীন শিক্ষার্থীদের আহ্বান করা হয় বিভিন্ন প্রশ্নের উত্তর করতে এবং ছোটো ছোটো অনুশীলনী সম্পূর্ণ করতে। প্রশ্ন ও অনুশীলনীগুলি সুচিন্তিতভাবে তৈরি করা হয়ে থাকে। এই সমস্ত কাজগুলি করানোর লক্ষ্যই হল শিক্ষার্থীদের রিহার্সাল দেওয়ানো, তথ্য জড়ো করে আরও বড়ো, আরও অর্থপূর্ণ কাঠামো অর্থাৎ স্কিমটা তৈরি করা, এবং নতুন বিকশিত তথ্য কাঠামোকে সদৃশ প্রতিবিম্ব এবং ব্যক্তিগতভাবে অর্থপূর্ণরূপকে পরিবর্তিত করা (Winne, 1985)।

উপস্থাপন অনুসরণ করে শিক্ষার্থীরা একাকী বা ছোটো ছোটো দলে পুনরুদ্রেককারী অনুশীলনী করে এবং নতুন উপস্থাপিত তথ্যাবলিকে পুনরাবৃত্তি করা হয় এবং মান বা পরিধি সরাসরি বাড়ানো হয়। শিক্ষক বা সমবয়সীরা প্রয়োজন অনুযায়ী নির্দেশনা সরবরাহ করে। যখন শিক্ষার্থী টাস্ক সম্পূর্ণ করতে পারে না, তখন সরাসরি তাদের সাহায্য করা হয়। এই সমর্থনকে বলা হয় রাজমিস্ত্রীদের মাচান নির্মাণ (**Scaffolding**)। অর্থাৎ একটু একটু করে শক্ত টাস্ক সরবরাহ করে শিক্ষার্থীকে সাহায্য করে তার সম্ভাবনাকে প্রস্ফুটিত করা। ত্রুটি সংশোধন করার জন্য নিয়মানুগ ফিড্‌ব্যাক প্রয়োজন অনুযায়ী সরবরাহ করা হয়। যখন শিক্ষার্থীরা নিজে নিজে স্কিমাটা সংযোজন করতে বা জোড় দিতে পারে এবং বিষয়বস্তুর নিয়মাবলি প্রয়োগ করতে স্বতঃশ্চল দক্ষতা অর্জন করে, তখন ধীরে ধীরে

শিক্ষক ওই মাচানটি তুলে নেন। পুনরায় অনুশীলনের মাধ্যমে শিক্ষার্থীদের পুনরুদ্রেকে, বিষয়বস্তুর নিয়মাবলি ব্যবহার এবং জ্ঞানমূলক স্ট্র্যাটেজিসমূহ আরও দক্ষ এবং স্বনিয়ন্ত্রিত হয়। পাঠসংক্রান্ত তথ্যের সঞ্চালন আরও বিভিন্ন ও জটিল টাস্কে নিয়ে যাওয়া হয়।

2.1 বিন্যাসকরণ (Sequencing)

উন্মুক্ত শিক্ষণে শিক্ষকই পাঠের অন্তর্গত ও পাঠ বহির্ভূত বিষয়বস্তু নির্ধারণ করেন। উভয় পরিস্থিতিতে তথ্য বিন্যাস্ত করার কথা বিবেচনা করা হয়। ভ্যান প্যাটেন ও তাঁর সহকর্মীবৃন্দ (Van Patten et al. 1986) অণুবিন্যাস (Micro Sequencing) ও ম্যাক্রোবিন্যাসের পার্থক্য করেছেন। অণুবিন্যাস হল কোনো ব্যক্তিগত ধারণা বা পাঠের অন্তর্গত নিয়মাবলি অনুযায়ী তথ্যের বিন্যস্তকরণ। ম্যাক্রোবিন্যাস জড়িত পাঠের অন্তর্গত বিভিন্ন ধারণা ও পাঠ বহির্ভূত বিভিন্ন ধারণা নিয়ে বহুমুখী তথ্যের বিন্যাসকরণ।

অণুবিন্যাসে সাধারণীকৃত সংজ্ঞাগুলিকে দৃষ্টান্ত হতে পৃথক করা হয়। যখন কোনো পাঠের উদ্দেশ্য থাকে শিক্ষার্থীরা টাস্কের তথ্যাবলি সাধারণীকৃত ফর্মে প্রয়োগ করবে—পাঠ চলাকালীন সাধারণত এগুলি করা হয় না। অর্থাৎ যে সব টাস্কগুলি অদূর ভবিষ্যতে সঞ্চালনের মুখোমুখি, গবেষণা ছেকে পাওয়া যায়। শিক্ষক প্রথমে সাধারণীকৃত কর্ম উপস্থাপন করে পরে এর বিভিন্ন দৃষ্টান্ত উপস্থাপন করবেন। যখন নির্দেশদানের উদ্দেশ্য হল শিক্ষার্থীরা সাধারণীকৃত কর্মকে বিভিন্নরকম টাস্কে সঞ্চালন করবে—অর্থাৎ সঞ্চালন দূরবর্তী হয়, সে ক্ষেত্রে কার্যকর বিন্যাসটি হবে আরোহী (Inductive)। উভয়ক্ষেত্রেই ধারাবাহিক দৃষ্টান্তগুলি বিন্যস্ত করা হবে সরল থেকে জটিল এবং সেগুলি একটির থেকে অন্যটি যতদূর সম্ভব পৃথক হবে (ভ্যান প্যাটেন ও তাঁর সহকর্মীবৃন্দ, 1986)।

শ্রেণিকক্ষে ম্যাক্রোবিন্যাস সংক্রান্ত গবেষণা বেশ শক্ত, কারণ শ্রেণিকক্ষের গতিশীল সামাজিক পরিস্থিতি অনুযায়ী জটিল নির্দেশদানের যথার্থ প্রয়োগ সংক্রান্ত অসুবিধা রয়েছে।

3. অনোন্যক শিক্ষণ (Reciprocal Teaching)

অনোন্যক শিক্ষণে (প্যালাইসার ও ব্রাউন, 1984) শিক্ষক বা তাঁর বিকল্প (যথা, আরও সুযোগ্য সমবয়সী দল বা কম্পিউটার সিস্টেম) শিক্ষার্থীদের শিখন সংক্রান্ত কথোকথনে নিযুক্ত করেন। কথোপকথনের নক্‌শা এমনভাবে করা হয় যাতে বিষয়বস্তু সংক্রান্ত সমস্ত প্রয়োজনীয় তথ্যাবলি উন্মোচিত হয় এবং অগ্রগতি নির্মাণের জন্য তথ্য প্রক্রিয়াকরণ স্ব-নিয়ন্ত্রিত করা যায়। যদিও অনোন্যক শিক্ষণ নবীন শিক্ষার্থীদের কীভাবে বর্ণনামূলক পাঠ উপলব্ধি করা যায় তার শিক্ষণের জন্য বিকশিত হয়েছিল তবুও তত্ত্বটিকে অধিকাংশ বিষয়বস্তুর ক্ষেত্রে ও বিভিন্ন বয়সীদের ক্ষেত্রে বিস্তৃত করা যায়।

টাস্ক উপাদানগুলির মডেলিং ও তথ্যের ব্যবহার (Modeling of Task Elements and Use of Information)

অনোন্যক শিক্ষণ শুরু হয় টাস্কের উপাদানগুলিকে শিক্ষকের মডেলিং করার সঙ্গে এবং দেখানো হয় কীভাবে এই সব তথ্যাবলি ব্যবহার করে টাস্কগুলি হতে অগ্রগতি (Achievements) নির্মাণ করা যাবে। প্রতিটি স্তরে শিক্ষক তথ্য প্রক্রিয়াকরণের প্রকৃতি ভালোভাবে উন্মুক্ত করেন যা জ্ঞান নির্মাণ করে। শিক্ষার্থীদের কাছে তথ্য প্রক্রিয়াকরণ টাস্কগুলি অবতারণা করার পর তারা এবং শিক্ষক (বা তারা ও সমবয়সীরা) ইনস্ট্রাক্টর ও শিক্ষার্থীর ভূমিকা বদলাবদলি করে। শিক্ষার্থীর ভূমিকাতে টাস্ক সম্পাদন করে, কিভাবে ইনস্ট্রাক্টরের মন্তব্য টাস্কের শিক্ষণে নির্দেশনা দান করে এবং কীভাবে তারা অগ্রগতি নির্মাণ করবে তা বিস্তৃত করে, সে সব নিয়ন্ত্রণ করে।

ইনস্ট্রাক্টরের ভূমিকাতে শিক্ষার্থীরা তথ্য সংক্রান্ত চারটি মৌলিক জ্ঞানমূলক নিযুক্তিতে পরিচালিত কথোপকথন পরিচালনা ও নিয়ন্ত্রণ করে। এই সমস্ত নিযুক্তিকরণ শিক্ষার্থীদের এমন কেন্দ্রীভূত সুযোগ সৃষ্টি করে যাতে তারা তথ্য প্রক্রিয়াকরণের রুটিন বিস্তৃত করতে পারে। চারটি মৌলিক জ্ঞানমূলক নিযুক্ত নিম্নরূপ :—

(a) প্রশ্ন উৎপাদন করা (Generating Questions) :

বিষয়বস্তু সম্পর্কিত টাস্কের অন্তর্নিহিত তথ্যাবলি সম্পর্কে শিক্ষার্থীরা প্রশ্ন উৎপাদন করে। প্রশ্ন উৎপাদন করে তারা বিষয়বস্তুর প্রয়োজনীয় ব্যাপারগুলি আবিষ্কার করার কাজে ও কীভাবে এই টাস্কে অংশগ্রহণ শিখন লাভ করায়, তাতে জ্ঞানমূলকভাবে নিযুক্ত হয়। টাস্ক যত অগ্রসর হয় শিক্ষার্থীদের তত সজাগ করা হয় ও নিয়ন্ত্রণ করতে সাহায্য করা হয়।

(b) অসুবিধাসমূহ ব্যাখ্যা করা (Clarification of Difficulties) :

বিষয়বস্তু উপলব্ধি করতে গিয়ে উদ্ভূত অসুবিধা ও জ্ঞানমূলক কৌশল চালিয়ে যেতে ও নিয়ন্ত্রণ করে শিক্ষার্থীদের উৎসাহিত করা হয়। বিস্তৃত ব্যাখ্যা কাজটির বিশেষ বৈশিষ্ট্যকে আলোড়িত করে কোথায় শিক্ষার্থীরা তাদের মনোযোগ বৃদ্ধি করবে বা তথ্য প্রক্রিয়াকরণ পুনগঠিত করবে। শিক্ষার্থীদের জ্ঞানমূলক এবং প্রেরণামূলক ঘাটতিসমূহের সঞ্চয়কেও একটি নিবারণ করে।

(c) জোড়মুখে পরবর্তী ধাপ অনুমান করা (Prediction of next stage at Seams) :

টাস্কের ধাপসমূহ বা বিভিন্ন অনুশীলনীর সংযোগ বা জোড়মুখের ক্ষেত্রে পরবর্তী স্তরটি কী হবে সে সম্পর্কে শিক্ষার্থী আগাম অনুমান করতে পারে। এরকম ভবিষ্যদ্‌বাণী বা আগাম অনুমান করার জন্য তারা পূর্বজ্ঞানকে উজ্জীবিত করতে এবং এর সঙ্গে বিষয়বস্তুর বর্তমান প্রাসঙ্গিক তথ্যকে জুড়বে। এটি পূর্বজ্ঞানকে সক্রিয় করে ও কার্যোপযোগী করে তোলে। শেষে শিক্ষার্থী তার পূর্বজ্ঞানকে কাজে লাগিয়ে টাস্কের পরবর্তী ধাপের উপলব্ধি মাত্রাকে নিয়ন্ত্রণ করতে পারে।

(d) জোড়মুখে সংক্ষিপ্তসার করা (Summarization at Seams) :

টাস্ক ও অনুশীলনীগুলির সংযোগস্থলে বা জোড়মুখে শিক্ষার্থী এতদূর পর্যন্ত যা শিখেছে তার একটি সংক্ষিপ্তসার প্রস্তুত করে।

সংক্ষিপ্তসার প্রস্তুত ক্রিয়া (Operations for Summarization) .:

সংক্ষিপ্তসার প্রস্তুত করতে দুটি মূল ক্রিয়া (operation) জড়িত :

(i) প্রথমটি হল বিষয়বস্তুকে নিয়ন্ত্রণ করে মূল ধারণাটি শনাক্ত করা, ইতোমধ্যে যা ঘটেছে তার পুনরাবৃত্তি ও পুনর্মার্জিত করার জন্য নিয়ন্ত্রণ করা।

(ii) অন্যটি হল এই সমস্ত প্রধান উপাদানসমূহ বা ধারণাগুলির সম্পর্কসমূহ একত্র করে বিষয়বস্তুর উচ্চস্তরের প্রতিনিধিত্ব নির্মাণ করা।

বিশেষ টাস্কগুলি সম্পন্ন করতে গিয়ে এখনও পর্যন্ত যে সব সংঘর্ষের মুখোমুখি হতে হয়েছে, কার্যসমূহ সেসবকে শিক্ষার্থীদের সাধারণীকরণ করার ক্ষমতা বৃদ্ধি করে। কার্যসম্পাদন করার জন্য যে সব তথ্য প্রক্রিয়াকরণ করা হয়েছে, সেগুলির সংক্ষিপ্তসার প্রস্তুত করা যেতে পারে।

4. অনুসন্ধানপ্রবণ নির্দেশদান (Inquiry Oriented Instruction) :

অনুসন্ধানপ্রবণ নির্দেশদানের সংজ্ঞাত বৈশিষ্ট্য হল যে নির্দেশদান উদ্দেশ্যাবলি অনুযায়ী ধারণামূলক বা অধিজ্ঞানমূলক (Meta Cognitive) তথ্যাদি সরাসরি শিক্ষার্থীদের কাছে উন্মুক্ত করা হয় না। বরং এখানে শিক্ষক একটি বৌদ্ধিক ও সামাজিক পরিবেশ সৃষ্টি করেন। এই পরিবেশে শিক্ষার্থীরা অনুসন্ধানমূলক অভিযান করবে। এই অভিযানের উদ্দেশ্য হল বিষয়বস্তু ও জ্ঞানমূলক স্ট্র্যাটেজি আবিষ্কার করা।

অনুসন্ধানপ্রবণতার নীতি (Principles of Inquiry Orientation) :

এই প্রবণতার নীতি হল—

(a) বিষয়বস্তু সংক্রান্ত জ্ঞান শনাক্ত করা ও অর্জন করার ব্যক্তিগত পরিকল্পনা করা।

(b) টাস্ক হবে অন্তঃজ (Instrinsic) প্রেষণা উদ্রেককারী ও অধিজ্ঞানমূলক জ্ঞান স্বতঃস্ফূর্তভাবে বিকশিত হবে।

(c) একই অভিযান প্রক্রিয়াতে শিক্ষার্থীরা জ্ঞান ও প্রবণতাকে (Aptitude) হাতুড়ি পিটিয়ে উপযোগী করে নেয় (Malleable)। এর সাহায্যে শিক্ষার্থী শিখন প্রক্রিয়াকে বিকাশমূলক, যুগপৎ নির্মাণমূলক এবং পূর্বাপর পদ্ধতিগুলির পরিমার্জনকারী হিসাবে শিখনকে উপলব্ধি করে।

সম্ভবত সবচেয়ে সুপরিচিত অনুসন্ধানপ্রবণ নির্দেশদান সাচ্‌ম্যান (Suchman) প্রস্তুত করেছেন। যদিও এই মডেল বিজ্ঞান শিক্ষণের জন্য প্রথম ব্যবহৃত হয়েছিল, পরে এর পরিধি সকল বিষয়ের ক্ষেত্রে বিস্তৃত করা হয়েছে।

(i) ধাঁধামূলক পরিস্থিতি উপস্থাপন (Presentation of Puzzling Situation) : নির্দেশদান কার্য শুরু করা হয় শিক্ষার্থীদের কাছে ধাঁধামূলক পরিস্থিতি উপস্থাপন করে। সর্বাপেক্ষা অনুকূল ধাঁধাগুলি শিক্ষার্থীদের জগৎ সম্পর্কে ধারণাকে চ্যালেঞ্জ করে। তারা যা ধাঁধাতে পর্যবেক্ষণ করছে ও জগৎ সম্পর্কে তাদের যে পূর্বজ্ঞান—এই দুয়ের মধ্যে ফাঁক বা ঘাটতি তাদের আলোড়িত করে। এই ধরনের ধাঁধাগুলি অন্তঃজ প্রেষণা উদ্রেককারী এবং শিক্ষার্থীদের অনুসন্ধান কাজে স্বতঃপ্রণোদিত ভাবে উদ্‌বুদ্ধ করে।

(ii) সম্ভাব্য সমাধান তৈরি করা (Framing Hypothesis) : ধাঁধা উপস্থাপন করার পর শিক্ষক ব্যাখ্যা করেন শিক্ষার্থীদের একক বা দলগতভাবে সম্ভাব্য সমাধান তৈরি করতে।

(iii) যাচাইকরণ (Testification) : এবার শিক্ষক কার্ল পপারের (Karl Popper) তত্ত্ব অনুযায়ী প্রত্যেকটি সম্ভাব্য অনুমানকে একে একে যাচাই করতে (Testify), মিথ্যাত্ব প্রতিপন্ন করতে (Falsify) বা সত্যতা প্রতিপন্ন করতে (Verify) তথ্য সংগ্রহে উৎসাহিত করবেন। তাদের উদ্দেশ্য হল ধীরে ধীরে একটি নীতি বা তত্ত্ব বিকাশ করা যা অন্যান্য প্রতিষ্ঠিত সত্য বা জ্ঞানকে বৈপরীত্য না করে উদ্ভূত অসংগতিকে (Discrepancy) বিচার করবে। অনুসন্ধান পর্ব চলাকালীন, যা দীর্ঘ সময়ব্যাপীও হতে পারে, শিক্ষক ও শিক্ষার্থী একই সঙ্গে শিক্ষার্থীদের পূর্বে করা তথ্য প্রক্রিয়াকরণ পর্যায়গুলিকে পুনরায় পরীক্ষা করে। এই মডেলের পর্যায়গুলি অনুসন্ধানকার্যে নির্দেশ দান করার জন্য সমস্যা সমাধান পদ্ধতি এবং স্বয়ং নিয়ন্ত্রণ প্রক্রিয়া (Self-Regulative) সমূহে জ্ঞানমূলক স্ট্র্যাটেজি অনুসরণ করা হয়। অতএব অনুসন্ধান কার্যের বিভিন্ন স্তরগুলির মাধ্যমে শিক্ষার্থীরা যত অগ্রসর হয় তারা তত উন্মুক্তকারী ও অনোন্যক শিক্ষণের তথ্য প্রক্রিয়াকরণ কার্যাবলি অনুসরণ করে।

5. পাঠ্যপুস্তকের সাহায্যে শিক্ষণ (Teaching by Text) :

পাঠ্যপুস্তক ব্যবহার করে শ্রেণিকক্ষে শিক্ষণ সংক্রান্ত গবেষণা করা তুলনামূলকভাবে সোজা—আর বয়স্ক শিক্ষার্থীরা বেশির ভাগ বই পড়েই বেশি শেখে।

নির্দেশনা দানের দুটি উপায় (Two Ways of Guidance) :

পাঠ্যপুস্তক লেখকরা শিক্ষার্থীদের পাঠে প্রধানত দুটি উপায়ে নির্দেশনা দিয়ে থাকেন—

(a) পূর্বজ্ঞানের সঙ্গে নতুন তথ্য বা জ্ঞানকে যোগ করতে খুবই সতর্কতার সঙ্গে ধারণামূলক জ্ঞানকে নির্বাচন করেন।

(b) পাঠ্যপুস্তকের পরিপূরকের মাধ্যমে যথা হেডিং, গ্রাফ্, ছন্দবদ্ধবাণী প্রভৃতির মাধ্যমে পাঠচলাকালীন ও তারপরে শিক্ষার্থীদের তথ্য প্রক্রিয়াকরণে আহ্বান করেন। নীতিগত ভাবে শিক্ষক শ্রেণিকক্ষে যা শিক্ষণ দেন, লেখক তারই সমান্তরাল কাজ করে থাকেন। উভয়ক্ষেত্রেই তথ্য প্রক্রিয়াকরণ তত্ত্ব শিক্ষার্থীদের জ্ঞানের বিকাশের জন্য উপযুক্ত কার্যকর সেটিং সৃষ্টি করতে ইনস্ট্রাক্টরকে নির্দেশনা সরবরাহ করে।

সাম্প্রতিক গবেষণায় পাওয়া গেছে পাঠ্যপুস্তকের সাহায্যে শিক্ষণের সাধারণ বৈশিষ্ট্যগুলি হল :—

(a) প্রথমে লেখক পাঠ্যপুস্তকে যে সব সংকেত (Cue) সরবরাহ করেছেন তার সঙ্গে সামঞ্জস্য (Match) করে শিক্ষার্থীদের নিজস্ব জ্ঞানমূলক কৌশল গড়ে তুলতে শেখানো হয়।

(b) শিক্ষার্থীরা ধীরে ধীরে শেখে পাঠ্যপুস্তকের তথ্যাবলিকে জ্ঞানমূলক প্রক্রিয়াকরণের জন্য সংকেতগুলিকে শনাক্ত করতে, সংকেতগুলি যে চিহ্ন বা অর্থ ইঙ্গিত করছে সেগুলিকে রুটিনে উপযুক্তভাবে প্রয়োগ করা, এবং

(c) যখন তারা স্বতঃপ্রণোদিত হয়ে জ্ঞানমূলক প্রচেষ্টাতে সমস্ত কৌশল প্রয়োগ করে, তখন তাঁদের অগ্রগতির (Achievement) উন্নতি হয় (পিয়ারসন এবং ফিল্ডিং, 1991)।

কোনো পাঠ্যপুস্তকের বিষয়বস্তু উপলব্ধি করার সময় শিক্ষার্থীর মূল টাস্কটি হল কোন্ তথ্যটি সবচেয়ে জরুরি তা নির্ধারণ করা। যথা সংক্ষিপ্তসার, মূল বিষয়বস্তু, ব্যাপক কাঠামো (Macro Structure) বা বিশেষ থিম (**ডোল ও তাঁর সহকর্মীবৃন্দ**, 1992)। গবেষণাতে বার বার সুস্পষ্টভাবে প্রমাণিত হয়েছে যে যারা খুব ভালোভাবে বিষয়বস্তু উপলব্ধি করতে পারে ও ভালো শেখে, তারাই কোন্ তথ্যটি সবচেয়ে গুরুত্বপূর্ণ তা সঠিক শনাক্ত করতে পারে। পাঠ্যবিষয়ের মূল বৈশিষ্ট্য বাঁকা ছাঁদের অক্ষর (Italics) বা হেডিং—এদের সংকেত সাহায্যে শিক্ষার্থী মূল ধারণার অবস্থান নির্ণয় করতে পারে।

শিখনের দ্বিতীয় প্রধান কাজটি হল বিষয়বস্তুর পূর্ণ সারসংক্ষেপ এমনভাবে নিজে নির্মাণ করা যাতে এটি পাঠ্য বিষয়ের ম্যাক্রোকাঠামোর তুল্য হয়।

সংক্ষিপ্তসার প্রস্তুত করার প্রক্রিয়া (Operations for Summarization) :

এই সংক্ষিপ্ত প্রস্তুত করার তিনটি সুস্পষ্ট ক্রিয়া (Operations) রয়েছে :

(i) মূল ধারণাগুলিকে অপেক্ষাকৃত কম গুরুত্বের কেন্দ্রীয় ধারণা থেকে সম্পূর্ণ পৃথক করা,

(ii) তথ্যকে ঘনীভূত বা নিবিড় করে অতিজ্ঞানকে **(Super Knowledge)** অবতারণা করা। এটি ব্যক্তিগত ধারণাকে অন্তর্ভূক্ত করবে, এবং

(iii) সুসংহত কাঠামো সৃষ্টি করে তথ্যাবলি সহত করা (হাইডি ও এন্ডারসন, 1986)।

লেখকরা অবশ্য সরাসরি রূপরেখা (Outline) দিয়ে শিক্ষার্থীদের সংক্ষিপ্তসার লিখতে নির্দেশনা সরবরাহ করতে পারেন। বা কখনও অগ্রণী সংগঠক সরবরাহ করে উচ্চস্তরের সাধারণীকরণ বা বিমূর্ততা সৃষ্টি করতে শিক্ষার্থীদের অগ্রণী করতে পারেন। সংক্ষিপ্তসার লেখার কাজে শিক্ষার্থীদের জড়িত করার জন্য পরিপূরক কার্যাবলি যথা, ধারণা-ম্যাপ (Concept Mapping) তৈরি করা পাঠ্য তথ্য সম্পর্কে সমবয়সি দলকে (Peers) নির্দেশদান করা এবং শেষে সংক্ষিপ্তসার লেখা—এসব খুব ফলপ্রসূ (পিয়ারসন ও ফিল্ডিং 1991)। চিত্র বা ছবি (Figures) অনেক সময় শিক্ষার্থীদের কাছে প্রয়োজনীয় সংকেত ও সংক্ষিপ্তসারের বিকল্প সরবরাহ করে থাকে।

তৃতীয় কেন্দ্রীয় টাস্ক (Third Central Task) :

পাঠ্যবিষয়ের প্রত্যেকটি বক্তব্য উপলব্ধি করে যথাযথ সিদ্ধান্ত গ্রহণ করতে পাঠককে আহ্বান করবে। সিদ্ধান্ত গ্রহণ পর্বে শিক্ষার্থীরা পাঠ্যবিষয়ের নতুন জ্ঞানের সাহায্যে পূর্বজ্ঞানকে বিকশিত করে ও মানসিক মডেলসমূহকে বিস্তৃত করে। এই সিদ্ধান্ত গ্রহণ কাজে অগ্রণী করার জন্য পাঠ্য বিষয়ের প্রারম্ভেই উদ্দেশ্যাবলি বা বিশেষ প্রশ্নাবলি দেওয়া হয়ে থাকে। এইগুলি শিক্ষার্থীর সিদ্ধান্ত গ্রহণ প্রক্রিয়াকে উন্মুক্তভাবে নির্দেশনা সরবরাহ করে।

সবশেষে, পাঠ্যবিষয় হতে শিখনে পাঠক হবেন সদাসক্রিয়। তারা গভীরভাবে তথ্য প্রক্রিয়াকরণ করতে ও এই সব কার্যাবলির ফলশ্রুতিও নিয়ন্ত্রণ করবে (পিয়ারসন ও ফিল্ডিং 1991)।

গভীর প্রক্রিয়াকরণের পূর্ববর্তী তিনটি কার্য (Three Preceding Functions of Deep Processing)

গভীর প্রক্রিয়াকরণের অন্তর্গত রয়েছে পূর্ববর্তী তিনটি কার্যাবলি—

(i) মূল ধারণাগুলি শনাক্ত করা,

(ii) সংক্ষিপ্তসার প্রস্তুত করা, এবং

(iii) সিদ্ধান্ত গ্রহণ করা।

এই সঙ্গে জড়িত রয়েছে নানা জ্ঞানমূলক কার্যাবলি যথা—(a) পাঠ্য বিষয়ে সরবরাহ তথ্য হতে সাদৃশ্য (Analogy) তৈরি করা, (b) জ্ঞাত স্কিমাটার পরিপ্রেক্ষিতে নতুন তথ্য বিশ্লেষণ করা, (c) পাঠকের আত্মপ্রশ্নন ও নিজস্ব উপলব্ধির স্ব-নিয়ন্ত্রণ, নতুন তথ্যসহ নতুন কাঠামো সৃষ্টি করার একটি প্ল্যাটফর্ম তৈরি করে এবং এইভাবে তথ্য সঞ্চয়ের শিখনে কোনো ঘাটতিকে নিবারণ করে (Walczyk and Hall, 1989)।

6. কম্পিউটর সিস্টেম দ্বারা নির্দেশদান (Instruction by Computer System)

এক অর্থে কম্পিউটার সিস্টেম নির্দেশদানের অন্য একটি মাধ্যম। যেহেতু কম্পিউটার শিক্ষার্থীদের কাছ থেকে তথ্য গ্রহণ করতে পারে এবং সেই অনুযায়ী শিক্ষার্থীদের নির্দেশদানও প্রক্রিয়াকরণ করতে পারে, তাই এদিক থেকে এটি স্থিতিশীল পাঠ্যপুস্তকের চেয়ে গুরুত্বপূর্ণ। তথ্য প্রক্রিয়াকরণ শিক্ষণ তত্ত্বাবলি অনুযায়ী কৃত কম্পিউটার সিস্টেম হল পূর্ববর্তী সকল উপাদানসমূহের যথাযথ মিশ্রণ। এই সংকর তত্ত্বাবলির দুটি সক্রিয় এলাকা নিয়ে বর্তমানে গবেষণা হচ্ছে :—

(a) শিক্ষার্থী নিয়ন্ত্রিত নির্দেশনাদানমূলক নির্দেশনার ভারসাম্য বজায় রাখা, এবং

(b) পাঠ চলাকালীন নির্দেশদান গ্রহণ করার ভিত্তি তৈরি করার জন্য শিক্ষার্থীর তথ্য প্রক্রিয়াকরণকে মডেল হিসাবে ব্যবহার করা।

6.1. শিক্ষার্থীর নিয়ন্ত্রণ (Learner Control)

নির্দেশদান কম্পিউটার সিস্টেমে প্রোগ্রাম করা থাকে। তথ্যের অধিগম্যতা ও যথাযথ নির্দেশনা অনুযায়ী ও শিক্ষার্থীর স্বকীয়তা অনুযায়ী বৈচিত্র্যপূর্ণ নিয়ন্ত্রণের সুযোগ দেওয়া হয়। যেমন, অনেক সিস্টেমে শিক্ষার্থী যদি বিচার করে যে তার অগ্রগতি যথাযথ হয়েছে অর্থাৎ অভীষ্ট লক্ষ্য অনুযায়ী হয়েছে, তাহলে সে প্রোগ্রাম থেকে নির্গত হতে পারে। অন্য একটি সিস্টেমে শিক্ষার্থীদের বিভিন্ন রকম বিষয় ও তার সহযোগী বিভিন্ন মাধ্যম একসঙ্গে সরবরাহ করা হয়। এগুলি হল পাঠ্য বিষয়, গ্রাফিক্স, গতিশীল অ্যানিমেশন, ভিডিও স্বর, শ্রবণ তথ্য (যথা—মিউজিক), সিস্টেমসমূহের ভূমিকায়ন (Simulations) এবং মেশিন ও রোবটদের কৃত ক্রিয়াসকল।

স্বনিয়ন্ত্রণ (বা শিক্ষার্থী নিয়ন্ত্রণ) নিয়ে উপযুক্ত অভিযোজনের জন্য কোন্‌টি বেশি পছন্দ সাম্প্রতিক গবেষণা সেসব অনুসন্ধান করছে।

6.2. শিক্ষার্থী মডেল (Student Models) :

শিক্ষণ কাজের অন্যতম গুরুত্বপূর্ণ হল নির্দেশদান করার জন্য পেশাগত দক্ষতাটি সঠিক জানা। তা হল ঠিক কোন্‌টিতে কান দিতে হবে এবং কোন্‌টি উপেক্ষা করতে হবে। তারপর সেই পরিকল্পনাটি তৈরি করতে হবে যেটি শিক্ষার্থীর পক্ষে সর্বোৎকৃষ্ট। নির্দেশদান কম্পিউটার সিস্টেমের জন মানবমেধা একটি বিরাট চ্যালেঞ্জ। শিক্ষার্থী মডেলটি শুরু হবে শিক্ষার্থীর পূর্বজ্ঞান অনুযায়ী একটি অসম্পূর্ণ তাত্ত্বিক প্রতিনিধিত্ব নিয়ে; এর পরিপূরক থাকবে নির্দেশদান নীতিসমূহ নিয়ে সংগঠিত সেট। টিউটোরিয়াল উন্মোচিত হওয়ার সঙ্গে সঙ্গে সিস্টেমের সঙ্গে শিক্ষার্থীর প্রতিটি মিথস্ক্রিয়া হবে একটি সম্ভাব্য উপাত্ত (Datum)। এটি অবশ্য নির্দেশদানে শিক্ষার্থীর সক্রিয় অংশগ্রহণ মডেলকে পুনর্মার্জিত করতে ব্যবহৃত হবে। সঙ্গে সঙ্গে শিক্ষার্থীর প্রগতি অনুযায়ীও নির্দেশদান ক্রিয়া সহযোজন করবে। এই বিশাল পরিমাণ তথ্য সহজেই শিক্ষার্থীর তথ্য প্রক্রিয়াকরণের তাত্ত্বিক মডেলকে অভিভূত করবে।

তথ্যের এই অতিভোজনকে বিবেচনা করার জন্য সেল্ফ (Self, 1990) একাধিক সুপারিশ করেছেন—

(i) সিস্টেমটি এমনভাবে নক্শা করতে হবে যাতে এটি শিক্ষার্থীর কাছ থেকে সরাসরি অধিজ্ঞানমূলক জ্ঞান (Metacognitive Knowledge) নিঃসরণ করে।

(ii) যদি তত্ত্বের কোনো প্রয়োজন না থাকে যে কীভাবে টাস্ক করতে হবে, তাহলে সিস্টেম সে ব্যাপারে নির্দেশনা দেবে না। তা ছাড়া শিক্ষার্থীর দুর্বলতা কোথায় তা না খুঁজে তাত্ত্বিক মডেলের উন্নয়ন করার জন্য বর্ণনামূলক তথ্যের দিকে জোর দেবে।

(iii) শিক্ষার্থীর অধিজ্ঞান স্তর ও গভীর প্রক্রিয়াকরণকে উজ্জীবিত করতে সিস্টেমটি শিক্ষার্থীর জ্ঞানের প্রতিনিধিত্বকে প্রদর্শন করবে এবং এগুলি বিশ্লেষণ করার জন্য শিক্ষার্থীদের আমন্ত্রণ করবে। এইসব নীতিগুলি একসঙ্গে শিক্ষার্থীকে স্ব-নির্দেশিত শিখনে জড়িত করে, অনোন্যক শিক্ষণ মডেলের কয়েকটি উপাদানও প্রয়োগ করে এবং নির্দেশদান হতে উদ্ভূত জ্ঞানমূলক মধ্যস্থতাকারী শিখন মডেলে উত্থাপিত ইস্যুগুলি নিয়ে সরাসরি প্রতিফলন করে (Winne, 1992)।

7. উপসংহার (Conclusion)

শিক্ষার্থীরা হচ্ছে সক্রিয় অনুসন্ধানকারী এজেন্ট। তারা নির্দেশদান সংকেতকে ভিত্তি করে তাদের নিজস্ব তথ্য প্রক্রিয়াকরণের নিমিত্ত নির্দেশনার অন্বেষণ করে।

নির্দেশদানে শিক্ষার্থীর জ্ঞানমূলক অংশগ্রহণে নির্দেশনা দানের জন্য দুটি কেন্দ্রীয় উপাদান হল পূর্বজ্ঞান (ধারণামূলক ও অতিজ্ঞানমূলক) এবং নির্দেশদানমূলক পরিবেশের উপাদানসমূহ। যদি শিক্ষার্থীর পূর্বজ্ঞানের ঘাটতি থাকে বা তথ্য প্রক্রিয়াকরণের জন্য প্রয়োজনীয় সংকেত অস্পষ্ট বা অনুপস্থিত থাকে, তখন শিক্ষার্থী অধিজ্ঞানমূলক জ্ঞান প্রয়োগ করে সেটি উদ্ভাবন করে, কখনো কখনো তা অক্ষমভাবে করে। তথ্য প্রক্রিয়াকরণ শিক্ষণ তত্ত্ব এটিই উপলব্ধি করতে অনুসন্ধান করে যে কীভাবে শিক্ষার্থীরা পূর্বজ্ঞানের সঙ্গে শেখে এবং কীভাবে জ্ঞানের সঙ্গে মিথস্ক্রিয়াকে নির্দেশনা করতে হয় যাতে অভীষ্ট লাভ করা যায়।